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USDA United States Department of Agriculture

Forest Service

Tongass National Forest

Publication No. R10–MB–399

January 2000

Emerald Bay Timber Sale

Draft Environmental Impact Statement

USDA United States Department of Agriculture
Forest Service
Alaska Region
Tongass National Forest
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Ketchikan, AK 99901
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File Code: 1950
Date: January 10, 2000

Dear Planning Participant:

Enclosed is the Draft Environmental Impact Statement (DEIS) for the Emerald Bay Timber Sale in the Tongass National Forest. The entire DEIS is included in one document, which describes one no-action alternative and two action alternatives ranging form 8–16 million board feet of harvest. Proposed harvest methods range from a mix of traditional clearcutting to all uneven-aged management. My preferred alternative at this point is Alternative C which emphasizes uneven-aged management.

The comment period on the DEIS must be a minimum of 45 days from the date of publication of the notice of availability in the Federal Register, expected to be January 30, 2000. In order to ensure that filing, printing and mailing timelines incorporate this minimum period, the deadline for comments will be April 15, 2000.

Federal Court Decisions have established that reviewers of a DEIS must structure their participation so that it is meaningful and alerts an agency to the reviewer's position and contentions. Environmental objections that could have been raised at the Draft stage may be waived if not raised until after completion of the Final EIS. This is so substantive comments and objections are made available to the Forest Service at a time when they can be evaluated and addressed in the Final EIS.

A public meeting will be scheduled during the comment period. The date and location for this meeting will be published in the Ketchikan Daily News and the Wrangell Sentinel. You are encouraged to review and comment on the DEIS and participate in the public meeting. Please send written comments to:

Jerry Ingersoll
District/Monument Ranger
Attn: Emerald Bay
3031 Tongass Ave.
Ketchikan, AK 99901

Your input will be used to prepare the Final EIS and Record of Decision. If you have questions please contact Susan Marthaller (907) 228–4124 or Devin Fox at (907) 228–4126. Your interest in the management of the Tongass National Forest is appreciated.

Sincerely,

Tom Puchlerz

THOMAS PUCHLERZ
Forest Supervisor

Draft Environmental Impact Statement
Emerald Bay Timber Sale

United States Department of Agriculture
Forest Service Alaska Region

Lead Agency: U.S.D.A. Forest Service
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Abstract

The USDA Forest Service proposes to harvest approximately 8-16 million board feet of timber in the Emerald Bay Project Area, Ketchikan–Misty Fiords Ranger District, Tongass National Forest, under guidance of the Tongass Land and Resource Management Plan of 1997 (Forest Plan). The Proposed Action analyzed in this Draft Environmental Impact Statement (Draft EIS) is designed to implement direction contained in the Forest Plan. The purpose and need for this Project is to implement Forest Plan direction. This direction is consistent with providing for the multiple use and sustained yield of forest resources and includes: (1) to help provide a sustained level of timber supply to meet annual and Forest Plan planning cycle market demand, (2) to provide local employment in the wood products industry. Another objective is to provide timber volume that will contribute to the timber supply under the Tongass National Forest timber-sale program. This Draft EIS describes two action alternatives which provide different combinations of resource outputs and locations of harvest units. There is one No-action Alternative. Alternative A (the No-Action Alternative) proposes no new harvest from the Project Area at this time. Alternative B proposes harvest units which provide timber using a combination of conventional logging systems and helicopter harvesting. Alternative C proposes to meet the purpose and need using all helicopter harvest and all uneven-aged harvest prescriptions.

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Chapter 1

Purpose and Need

Chapter 1

Purpose and Need

Introduction

In compliance with the National Environmental Policy Act (NEPA) and other relevant State and Federal laws and regulations, the Forest Service has prepared this Draft Environmental Impact Statement (Draft EIS) on the potential effects of timber harvest in the Emerald Bay Project Area (see Figure 1-1). The Project Area is located on the Cleveland Peninsula, and is within the Ketchikan–Misty Fiords Ranger District, Tongass National Forest, Alaska. This Draft EIS discloses the direct, indirect, and cumulative environmental impacts and any irreversible or irretrievable commitment of resources that would result from the proposed action and alternatives.

This Draft EIS is prepared according to the format established by the Council on Environmental Quality (CEQ) regulations for implementing the NEPA (40 CFR 1500-1508). Chapter 1, in addition to explaining the purpose and need for the proposed action, discusses how the Emerald Bay Project relates to the 1997 Tongass Land and Resource Management Plan (Forest Plan), and identifies the significant issues driving the Draft EIS analysis. Chapter 2 describes and compares the proposed action, alternatives to the proposed action, and a no-action alternative. Chapter 3 describes the natural and human environments that could potentially be affected by the proposed action and alternatives, and also discloses the anticipated potential. Chapter 4 contains the list of preparers, the Draft EIS distribution list, literature cited, a glossary, and an index. Appendix A discusses the reasons for scheduling the Emerald Bay Project environmental analysis now. Other appendices provide additional information on specific aspects of the proposed project. Additional documentation may be found in the Project planning record located at the Ketchikan–Misty Fiords Ranger District Office in Ketchikan, Alaska.

The Interdisciplinary Team (IDT) used a systematic approach to analyze the proposed action and alternatives to it, estimate the environmental effects, and prepare this Draft EIS. The planning process complies with NEPA and the CEQ regulations. Planning was coordinated with the appropriate Federal, State and local agencies, and local Federally-recognized tribes.

Proposed Action

The Forest Service proposes to harvest approximately 8 to 12 million board feet (MMBF) of timber from approximately 745 acres of National Forest land through a single timber sale beginning in the year 2000. This would require no new road construction and no log transfer facility (LTF) construction. Logs would be transported to barges in Emerald Bay using helicopter yarding. Timber would be sold from this project in a single sale.

Based on the environmental study and analysis in this Draft EIS, the Tongass Forest Supervisor will decide whether and how, to make timber available from the Emerald Bay Project Area in accordance with Forest Plan goals, objectives and desired future conditions.

This decision will include:

- the estimated timber volume to make available from the Project Area at this time, and the number and size of the individual timber sales;
- the location, design and schedule of timber harvest, silvicultural prescriptions, road construction and reconstruction, and reforestation;
- access management measures (road restrictions and closures);
- mitigation measures and monitoring requirements;
- whether or not there may be a significant restriction on subsistence use; and
- whether or not to change the location of one or more of the small Old-growth Habitat Reserves within or adjacent to the Project Area.

Project Area

The 7,845-acre Emerald Bay Project Area is located approximately 40 air miles north of Ketchikan, Alaska (Figure 1-1). It is located on the Cleveland Peninsula in the Emerald Creek and Birch Creek watersheds. Access to the area is by small plane originating in Ketchikan or Wrangell or by boat through Ernest Sound.

The Project Area includes value comparison unit (VCU) 721. Value comparison units are defined in the Introduction to Chapter 3. For analysis purposes, the Project Area boundaries are considered to be the same as the VCU boundaries. The VCU boundaries generally follow major watershed divides, however, the southern tip of the Project Area crosses slightly into the Wasta Creek drainage which drains into Spacious Bay. The VCUs are delineated in Figure 1-2.

Figure 1–1
Project Area Vicinity Map

Purpose and Need

The Emerald Bay Project is proposed at this time to respond to goals and objectives of the Forest Plan, and to help move the Project Area toward desired future conditions described in that Plan. The Forest Plan includes both forest-wide goals and objectives, and area-specific (land use designation) goals, objectives, and desired future conditions. Applicable forest-wide goals and objectives (Forest Plan, pp. 2-3 and 2-4) include:

1. Manage the timber resource for production of saw timber and other wood products from suitable timber lands made available for timber harvest, on an even-flow, long-term sustained-yield basis and in an economically efficient manner.
2. Seek to provide a timber supply sufficient to meet the annual market demand for Tongass National Forest timber, and the market demand for the planning cycle.
3. Provide a diversity of opportunities for resource uses that contribute to the local and regional economies of Southeast Alaska.
4. Support a wide range of natural resource employment opportunities within Southeast Alaska's communities.
5. The Forest Plan allocated over 30 percent of the Project Area to a Timber Production Land Use Designation (LUD), with sufficient timber volume available to help meet market demand.
6. Most of the other Timber Production LUDs on the Forest have or are planning to have timber harvest activities in them.
7. Timber management activities will contribute to meeting the goals, objectives, and desired condition for this LUD.

Applicable Project objectives include:

1. Provide insight and information into possible approaches to timber harvest with minimal road building, use uneven-aged management techniques to maintain a diverse range of structures, and a variety of wildlife habitats.
2. Provide an opportunity to gather information on long distance uneven-aged helicopter harvesting that could be effectively used in upcoming projects.
3. Attempt to minimize disturbance in adjoining Old-growth LUDs and minimize fragmentation of roadless areas while still meeting the goals, objectives, and desired condition for the Timber Production LUD.
4. Provide local employment opportunities in the wood products industry, consistent with providing for the multiple use and sustained-yield of all renewable forest resources.

Appendix A of this Draft EIS provides a more detailed rationale for why the Emerald Bay Project Area was selected for analysis at this time. Further clarification can be found in the next section regarding this project's relationship to the Forest Plan.

Relationship to Forest Plan

National Forest planning takes place at several levels: National, Regional, Forest, and Project levels. The Emerald Bay Draft EIS is a project-level analysis; its scope is confined to issues about the effects of the project. It does not attempt to address decisions made at higher levels. It does, however, implement direction provided at those higher levels.

The Forest Plan embodies the provisions of the National Forest Management Act, its implementing regulations, and other guiding documents. The Forest Plan sets forth in detail the direction for managing the land and resources of the Tongass National Forest. The Forest Plan is a result of extensive analysis, which is addressed in the Forest Plan Final EIS. When appropriate, the Emerald Bay Draft EIS tiers to the Forest Plan Final EIS, as encouraged by 40 CFR 1502.20. Also, this Draft EIS will summarize and cite documented analyses, rather than repeat the entire analysis.

Land Use Designations

The Forest Plan includes area-specific (land use designation) goals, objectives, and desired future conditions. The Forest Plan uses land use designations (LUDs) to guide management of National Forest lands within the Tongass. Each designation provides for a unique combination of activities, practices and uses. The Emerald Bay Project Area includes two LUDs: Timber Production and Old-Growth Habitat. The goals of each are described below and their locations are shown in Figure 1-2. The Forest Plan (Chapter 3) contains a detailed description of each LUD.

Table 1-1 gives the acreages within the Project Area of each LUD.

Table 1–1
Project Area Land Use Designations Acreages (National Forest Acres)

Timber Production	Old-Growth Habitat	Project Area Total
2,581	5,265	7,845

Source: Forest Plan, Chapter 3

Timber Production

The goals for the Timber Production LUD are similar to the Forest-wide goals and objectives listed above. For the Timber Production LUD, the desired future condition includes healthy stands in a balanced mix of age classes from young to harvestable. The goals of this designation are to: (1) maintain and promote industrial wood production from suitable timber lands, providing a continuous supply of wood to meet society's needs; (2) manage these lands for sustained long-term timber yields; and (3) seek to provide a supply of timber from the Tongass National Forest which meets the annual and planning-cycle market demand, consistent with the standards and guidelines of this LUD.

Applicable objectives include:

- Seek to reduce clearcutting when other methods will meet land management objectives.
- Improve timber growth and productivity on commercial forest lands.
- Plan, inventory, prepare, offer, sell, and administer timber sales and permits to ensure the orderly development of timber production.

Old-growth Habitat

Within areas allocated to the Old-growth Habitat LUD, the desired condition is that all

forested areas attain old-growth forest characteristics and provide a diversity of old-growth habitat types. The primary goals of the Old-growth Habitat LUD are to (1) maintain areas of old-growth forests and their associated natural ecological processes to provide habitat for old-growth associated resources, and (2) manage early seral conifer stands to achieve old-growth forest characteristic structure and composition based on site capability (Forest Plan, p. 3-76).

Applicable objectives include:

- Provide old-growth forest habitats, in combination with other LUDs, to maintain viable populations of... fish and wildlife species... that may be closely associated with old-growth forests.
- Contribute to the habitat capability of fish and wildlife resources to support sustainable human subsistence and recreational uses.

The Emerald Bay Project will respond to these goals and objectives, and will help move the Project Area towards the desired future conditions of the land use designations. The Project proposes timber harvesting on selected suitable timber lands for the production of sawtimber and other wood products, to help meet market demands for timber and provide resource production opportunities and employment for local communities. Harvest methods other than traditional clearcutting are proposed; harvest is expected to improve timber growth and contribute towards a balance of age classes. The areas allocated to Old-growth Habitat border the Project Area and comprise 67 percent of the Project Area itself as part of the Forest-wide system of Old-growth Habitat Reserves.

Key Forest-wide Standards and Guidelines in Project Area

The following standards and guidelines delineate areas not available for programmed timber harvest within the Timber Production LUD. Each applies to a specific habitat or ecological component. More detailed information about these and other standards and guidelines can be found in the Forest Plan, Chapter 4.

Beach and Estuary Fringe

The beach and estuary fringe is an area of approximately 1,000 feet inland from mean high tide around all marine coastline. Programmed timber harvest is not allowed and roads are located outside the fringe when possible.

Karst and Caves

Surveys were conducted to search for karst or caves. No karst or caves have been located within the Project Area.

Riparian

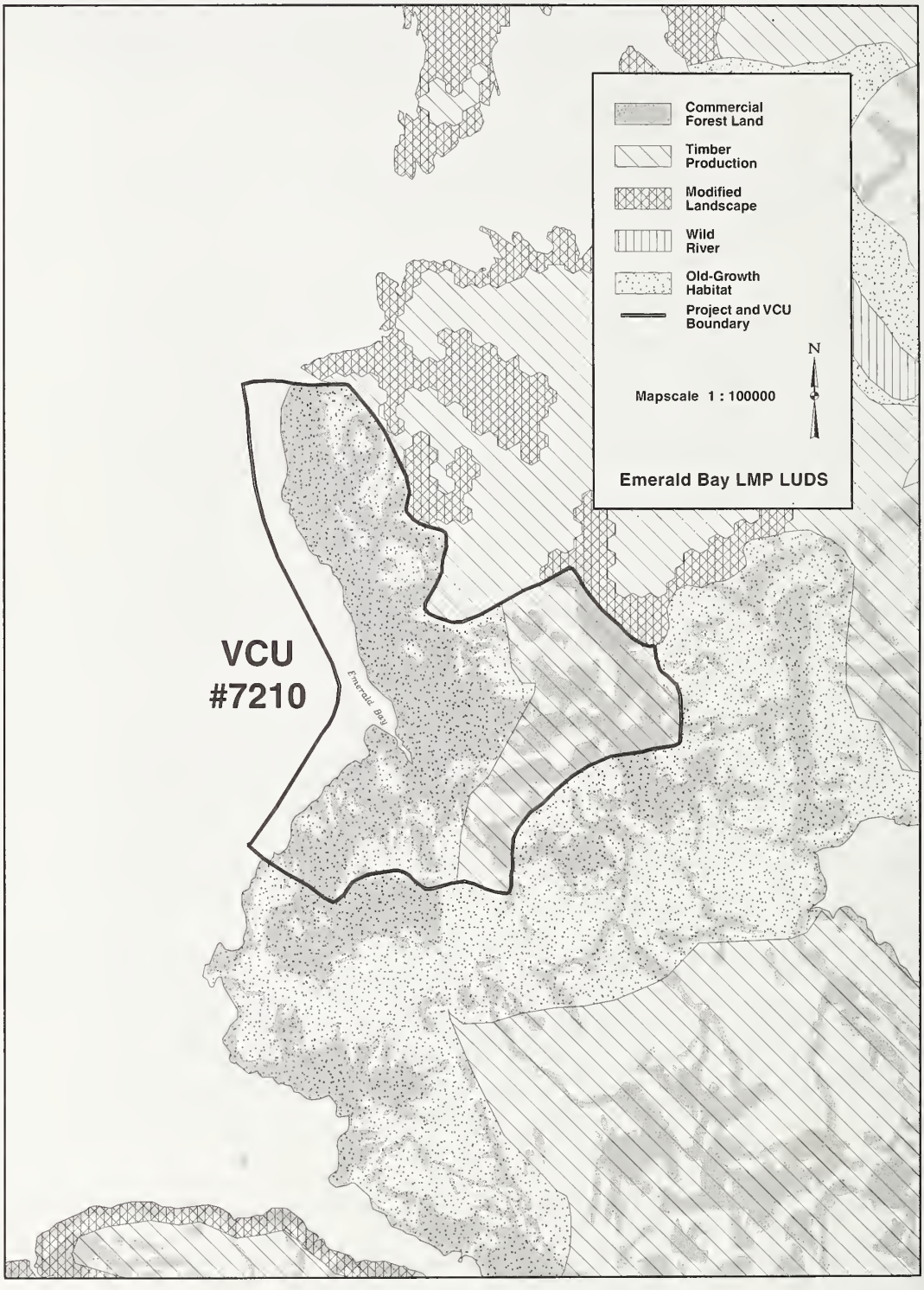
Riparian Management Areas are areas of special concern regarding fish, other aquatic resources, and wildlife. These areas are delineated according to the process-group direction in the Riparian Forest-wide Standards and Guidelines (Forest Plan, pp. 4-56 to 4-73). Some riparian boundaries may be adjusted after completion of a project-specific watershed analysis (Forest Plan, p. 4-56 and Appendix J). Timber harvest is not scheduled in Riparian Management Areas.

Other Land Status Within the Project Area

This is not a designation in the Forest Plan. However, for purposes of an EIS, it identifies lands within a Project Area which have been conveyed to the State, Native corporations or other private entities. There are no lands within the Emerald Bay Project Area which have been conveyed to State or private ownership.

Figure 1-2

Emerald Bay Project Area, Land Use Designations and Value Comparison Units



Public Involvement

Scoping

The Council on Environmental Quality (CEQ) defines scoping as "...an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 CFR 1501.7). The scoping process was used to invite public participation and collect initial comments. The public was invited to participate in the project in the following ways.

Notice of Intent (NOI)

A Notice of Intent was published in the *Federal Register* on August 17, 1998, when it was decided that an EIS was to be completed for the project.

Public Mailing

In early August, 1998, a letter providing information and seeking public comment (scoping document) was mailed to approximately 140 individuals and groups that had previously shown interest in Forest Service projects in Southeast Alaska. The mailing included seven Federal agencies, five State agencies and divisions, 22 Native and municipal offices, and 106 businesses and other organizations, groups, and individual citizens. Approximately 28 responses to this initial mailing were received.

Local News Media

Legal announcements about the project were printed in the August 15-16, 1998 weekend edition of the *Ketchikan Daily News* and the *Wrangell Sentinel* issue of August 13. A display advertisement with map, describing the project, was placed in the August 15-16, 1998, weekend edition of the *Ketchikan Daily News.*

Public Meetings

A public meeting was held at the Narrows Inn in Ketchikan on August 24, 1998 to provide information and discuss potential areas of concern and or interest that should be addressed in the Emerald Bay Project.

Draft EIS

Availability of Draft EIS for Public Comment

Availability of this Draft EIS was announced in the *Federal Register* and through notices in local papers. These notices started a 45-day comment period. Documents were also mailed to Federal and State agencies, Native and municipal offices, and others who requested them.

Issues

Issues Associated with the Proposed Action

Significant issues for the Emerald Bay Project were identified through public and internal scoping. Similar issues were combined into one statement where appropriate. The following two issues were determined to be significant and within the scope of the project decision. These issues are addressed through the Proposed Action and alternatives.

Timber Economics and Supply

This issue encompasses public concern over

- the amount of timber available and proposed for harvest,
- the methods of timber harvest,
- whether or not timber harvest should be continued,
- balancing timber production with other Forest uses,

- how the project contributes to the long-term timber supply, and
- cost-effective timber harvest.

New Road Construction

This issue relates to the construction of roads into areas designated for timber management but currently unroaded. This issue deals with roading in the Cleveland Roadless Area, and with roading through a medium old-growth reserve; specifically, whether or not a road should be built there, and if one is built, its management after completion of timber harvest.

Other Concerns

The following public concerns were considered but determined not to be significant issues. Some are already addressed through other processes or in the Forest Plan, or their resolution is beyond the scope of this project.

Forest Plan Management Prescriptions (Land Use Designations)

This issue focuses on the desire of some commenters to change the Forest Plan management prescriptions in order to eliminate, reduce, or increase the level of harvest (ASQ) and/or maximize specific resources. Included within this issue are suggestions that Forest Plan Standards and Guidelines or Best Management Practices not be implemented. Comments regarding the general management of the Tongass National Forest, Management Prescriptions, or procedural issues are beyond the scope of this project.

Regional Timber Supply and Demand Should be Refigured for the Emerald Bay EIS

Analysis of timber supply and demand is a Regional issue which exceeds the scope of this analysis. This issue was addressed as part of the Forest Plan process. A site-specific environmental analysis documents the effects of the proposed activities. Trying to predict the effects of the proposed activities upon the Regional timber supply and demand is beyond the capability and scope of this document, other than concluding that timber offerings resulting from the project will contribute volume to the Regional timber supply and will help meet demand. The volume of timber cleared in a NEPA document may be offered in whole, in part, or not at all, depending upon rapidly changing market conditions or other factors important in the overall management of the National Forests.

The issue of how the project contributes to the long-term timber supply is addressed as part of Issue 1: Timber Economics and Supply.

Cleveland Peninsula Road (Off Island) Transportation Link

The Cleveland Peninsula road connection is not a connected or reasonably foreseeable action that is ripe for a decision. The proposed transportation link is located approximately 6 air-miles from the Project Area. About 12 miles of road would be needed to service the proposed link.

Do Not Use a Predetermined Harvest Volume

The Council on Environmental Quality requires an implementable proposed action, which would include a harvest volume. Other alternatives represent different responses to the significant issues identified above.

Concerns Surrounding Soils, Hydrology, and Fisheries

Mitigation measures, including stream buffers, will be used to prevent significant impact to water quality and fisheries habitat (Forest Plan, Chapter 4 and Appendix C). These mitigation measures include the Tongass Timber Reform Act (TTRA) buffers, Forest Plan Riparian Management areas, beach fringe, construction timing restrictions, and limiting harvest on unstable soils.

Concerns Surrounding Recreation and Scenic Quality

Comments mentioned the importance of protecting the scenic quality from Ernest Sound. This issue is adequately addressed in the Forest Plan Standard and Guidelines and the further Tongass Plan Implementation Team (TPIT) clarifications. Forest management activities could have nonsignificant impacts to existing recreational pursuits by users of the Emerald Bay Project Area. More specifically, increased human access, timber harvest, and other developments could affect recreation values and opportunities such as hunting, fishing, and scenic quality.

Heritage Resources

A cultural resource survey was conducted and all sites will be avoided in accordance to law. The cultural resource report has been submitted (#1998-05-17) to the Alaska State Historic Preservation Office (SHPO).

Federal and State Permits, Licenses, and Certifications

To proceed with timber harvest as addressed in this EIS, various permits must be obtained from Federal and State agencies. Administrative actions on these permits would be initiated after the EIS is filed with the Environmental Protection Agency (EPA). The agencies and their responsibilities are listed below.

U.S. Army Corps of Engineers

- Approval of discharge of dredged or fill material into waters of the United States (Section 404 of the Clean Water Act of 1977, as amended)
- Approval of construction of structures or work in navigable waters of the United States (Section 10 of the Rivers and Harbors Act of 1899)

U.S. Coast Guard

- Coast Guard Bridge Permit (in accordance with the General Bridge Act of 1946) required for all structures constructed across navigable waters of the U.S.

U.S. Environmental Protection Agency

- Storm water discharge permit
- National Pollutant Discharge Elimination System review (Section 402 of the Clean Water Act)

State of Alaska, Department of Environmental Conservation

- Certification of compliance with Alaska Water Quality Standards (Section 401 Certification)
- Solid Waste Disposal Permit (Section 402 of the Clean Water Act)

State of Alaska, Department of Natural Resources

- Authorization for occupancy and use of tidelands and submerged lands

Legislation and Executive Orders Related to this Draft EIS

Shown below is a brief list of laws pertaining to project-specific planning and environmental analysis on Federal lands. Some of the laws are specific to Alaska, while others pertain to all Federal lands.

- National Historic Preservation Act of 1966 (as amended)
- Wild and Scenic Rivers Act of 1968, amended 1986
- National Environmental Policy Act (NEPA) of 1969 (as amended)
- Clean Air Act of 1970 (as amended)
- Alaska Native Claims Settlement Act (ANCSA) of 1971
- Marine Mammal Protection Act of 1972
- Endangered Species Act (ESA) of 1973 (as amended)
- Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended)
- National Forest Management Act (NFMA) of 1976 (as amended)
- Clean Water Act of 1977 (as amended)
- American Indian Religious Freedom Act of 1978
- Alaska Native Interest Lands Conservation Act (ANILCA) of 1980
- Archeological Resource Protection Act of 1980
- Cave Resource Protection Act of 1988
- Tongass Timber Reform Act (TTRA) of 1990
- Executive Order 11988 (floodplains)
- Executive Order 11990 (wetlands)
- Executive Order 11593 (cultural)
- Executive Order 12962 (aquatic systems and recreational fisheries)

In addition, the Coastal Zone Management Act (CZMA) of 1976, as amended, pertains to the preparation of an EIS. Federal lands are not included in the definition of the coastal zone as prescribed in the CZMA. However, the act requires that when Federal agencies conduct activities or developments that affect the coastal zone, that the activities or development be consistent to the maximum extent practicable with the approved State Coastal Management Program. This determination is made by the Forest Service.

The Alaska Coastal Management Plan incorporated the Alaska Forest Resources and Practices Act of 1979 standards and guidelines for timber harvesting and processing. The Forest Service standards and guidelines and mitigation measures described in Chapters 2 and 3 of this document meet or exceed State standards.

Availability of the Planning Record

An important consideration in preparation of this Draft EIS has been reduction of paperwork as specified in 40 CFR 1500.4. In general, the objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated. The planning record contains material which documents the NEPA process and analysis from the beginning of the Project to the publication of the Final EIS and ROD.

The planning record is available upon issuance of this Draft EIS, and is located at the Ketchikan–Misty Fiords Ranger District office in Ketchikan, Alaska. Reference documents such as the Forest Plan, the Tongass Timber Reform Act, the Resources Planning Act, and the Alaska Regional Guide are available at public libraries around the Region as well as at the Supervisor's Offices in Ketchikan, Petersburg and Sitka. The Forest Plan is also available on the internet and CD-ROM.

Chapter 2

Alternatives

Chapter 2

Alternatives

Introduction

This chapter describes and compares the alternatives considered by the Forest Service for the Emerald Bay Project. It includes a discussion of how alternatives were developed, an overview of mitigation measures, monitoring and other features common to all alternatives, a description and map of each alternative considered in detail, and a comparison of these alternatives focusing on the significant issues. It also identifies Alternative C as the Preferred Alternative. Chapter 2 is intended to present the alternatives in comparative form, sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public (40 CFR 1502.14).

Some of the information in Chapter 2 is summarized from Chapter 3, "Affected Environment and Environmental Consequences." Chapter 3 discusses the scientific basis for establishing baselines and measuring the potential environmental consequences of each of the alternatives. For a full understanding of the effects of the alternatives, readers will need to consult Chapter 3.

Landscape Analysis

The Emerald Bay Project Area (7,845 acres) was included in the larger Cleveland planning area that had been shown on the Ketchikan Area multi-year timber sale plans for the last several years. The Cleveland planning area encompassed that portion of the Cleveland Peninsula that lies within the Ketchikan Area. Under the Forest Plan ROD, April 1999 all VCUs in the Cleveland Planning were placed in non-development LUDs with the exception of the Emerald Bay Project Area (VCU 721). In order to synthesize the various resource conditions, objectives, and opportunities, an interdisciplinary team (IDT) conducted an informal landscape analysis of the Cleveland planning area. The informal landscape analysis, using information gathered by resource specialists and Forest Plan, direction identified logical "treatment" areas (silvicultural treatment accomplished through timber harvesting). The Emerald Bay area was given the highest priority for timber harvest consideration because of the relatively low impacts to the planning area as a whole. Its location outside the area of primary concern for local interest groups and most of the public, and the opportunities to gain valuable information to be used on projects, as well as the current and desired future conditions of the landscape (see discussion of Purpose and Need in Chapter 1) were factors in this ranking.

The unit pool for the Emerald Bay Project was based on the suitable and available commercial forest lands represented in the Forest Plan. A pool of potential units was then selected that reflects how much timber the Emerald Bay Project Area could potentially provide at this

time given the parameters of the Forest Plan. This preliminary harvest unit pool included somewhat more than 900 acres in 13 potential units. Additional early analysis of this unit pool led to deferring or dropping several potential harvest units from further consideration for the Emerald Bay Project. Some of these units could not be harvested and still be consistant with Forest Plan Standards and Guidelines, and some would require modifications to meet standards and guidelines that would make them uneconomical to harvest.

Based on short and long-term landscape or resource objectives (see Chapter 1), the IDT assigned preliminary timber harvest prescriptions for each potential harvest unit. This unit pool and the roads needed to access the units under Alternative B were then evaluated in the field. This pool of units was also used for public scoping for the project, and was identified at that time as the Proposed Action. The Proposed Action for this Draft EIS, as described in Chapter 1 and considered in detail as Alternative C, has changed slightly from the one described during scoping as a result of the field analysis.

Potential harvest units were validated, modified, dropped and/or deferred based on findings of the field investigations. Modifications were based on meeting Forest Plan Standards and Guidelines; for instance, if an unknown stream was discovered. Some units were adjusted to have more logical boundaries, and some expanded to prevent isolating timber stands from future harvest. The emphasis of the project on harvest methods other than clearcutting required adjusting many units originally designed for clearcutting, to facilitate logging systems. This effort led to the current unit pool, 745 acres and 10 units, which is the basis for Alternative C. All unit harvest prescriptions have been updated to reflect Forest Plan Standards and Guidelines, field investigations and IDT analysis, and to respond to public and interagency input. Potential harvest unit cards and related road cards are included as Appendices B and C of this document.

Development of Alternatives

The Proposed Action and each alternative presented in this Draft EIS provide a different response to the significant issues for the Emerald Bay Project. Each of these alternatives represents a site-specific proposal developed through intensive interdisciplinary team evaluation of timber harvest unit and road design, based on field verification. Unit identification and design also made use of topographic maps and aerial photos, and a large quantity of resource data available in geographic information system (GIS) format.

The IDT used information from the analysis of scoping comments, in conjunction with the field-verified pool of units for the Project Area, to formulate different alternative approaches. Preliminary analysis and management direction were used to further refine the alternatives described here for the Emerald Bay Project.

As has been discussed, a number of individual potential units have been eliminated from consideration at this time. Other units have been deferred because of resource or economic concerns. However, no project alternatives (units grouped for a specific purpose) were formulated other than those considered here in detail.

Items Common to All Alternatives

The Forest Service uses many mitigation and preventive measures in the planning and implementation of land management activities. The application of these measures begins during the planning and design phases of a project. These measures come from or link to the Forest Plan, and continue through all phases of subsequent forest management related to the project. Higher level direction is also contained in the Alaska (Forest Service Region 10) Regional Guide, and applicable Forest Service manuals and handbooks.

IDT specialists use on-the-ground inventories, computer inventories, and aerial photographs to prepare the documents, called unit cards, for each harvest unit in the unit pool for the alternatives. Cards are also prepared for each segment of road. Resource specialists include their concerns on the cards and then describe how the concerns can be addressed in the design of each unit and road segment. Resource concerns and mitigation measures will be refined further during final layout, when specialists have one more opportunity to revise their unit and road card recommendations.

Timber volumes used throughout the document are expressed in thousands of board feet (MBFs). The regional averages used to convert volumes from MBFs to hundreds of cubic feet (CCFs) follow:

Alaska yellowcedar and western redcedar, CCF = MBF/0.45.

Hemlock, CCF = MBF/0.50.

Sitka spruce, CCF = MBF/0.57.

Applicable Forest Plan Standards and Guidelines, Best Management Practices (BMPs), and other specific mitigation measures are identified on the harvest unit and road cards for the project (located in Appendices B and C). The following items are listed to highlight some of the key mitigation measures, findings, or processes applied to the project that are common to all alternatives; they are by no means a complete list. All alternatives have been analyzed for cumulative effects.

Standards and Guidelines

Fish and Marine Habitats

Forest Plan Standards and Guidelines for riparian areas apply to all lakes and streams within the Project Area.

Watershed analysis for the project has included landscape, watershed, and site-level considerations. No opportunities were identified for adjusting Riparian Management Area boundaries.

Road cards show which streams are likely to need special attention during implementation, such as the use of timing restrictions for in-stream activities, larger culverts, or bridges (Appendix C).

No new log transfer facilities (LTF) are proposed for Alternative C. Alternative C proposes to place logs directly onto barges using helicopter yarding. One new LTF is proposed in Alternative B. This LTF is proposed as a barge-only LTF.

Heritage Resources

Forest Plan Standards and Guidelines for heritage resources state that the preferred management of sites listed in, nominated to, or eligible for the National Register of Historic Places is avoidance and protection (p. 4-15). Evaluation of the data collection needs and survey strategy is described in a 1995 Agreement between the Forest Service Alaska Region, Alaska

State Historic Preservation Office, and the Advisory Council on Historic Preservation (#95MOU-10-029). This agreement modifies the standard procedures described in Section 106 of the National Historic Preservation Act, 1966.

No significant historic properties were discovered during field investigations. (USDA FS CRM Reports 1998-05-17).

Most of the planned management activities in the Emerald Bay Project Area fall in low-sensitivity areas for cultural resources as defined in the 1995 agreement (#95MOU-10-029); they occur at elevations above 100 feet and do not possess other characteristics which would suggest focused historic or prehistoric activities. Field investigations were concentrated within areas of higher potential for locating significant cultural resource sites along the coast and estuaries including the proposed LTF location. The possibility that significant historic properties exist within the Area of Potential Effects for this project is very low. The Alaska State Historic Preservation Officer concurred with the recommendation that no significant cultural resource sites would be affected by the proposed activities based upon the literature review and subsequent field investigations. Clearance will be recommended based on this study. Following harvest, a sample of roads and units will be monitored to test the assumptions of the sensitivity model.

Soils, Water Quality and Wetlands

Potential harvest units with slopes greater than 72 percent have received an on-site analysis of slope and Class IV channel stability, and an assessment of potential downstream effects. Only areas with low levels of risk are included in the unit pool.

Proposed road locations avoid slopes greater than 67 percent, unstable areas, and slide-prone areas where it is feasible to do so.

All proposed roads have been located and will be designed to avoid or minimize effects on wetlands.

Subsistence

All alternatives have been evaluated in compliance with ANILCA, Title VIII, Section 810.

Timber Harvesting

In Alternative C, non-clearcut prescriptions are used for all harvest units. Types of harvest include individual tree and group selection. Alternative B has a combination of traditional clearcutting and individual tree selection.

Risks from windthrow have been evaluated, and methods to minimize windthrow are incorporated into all harvest unit prescriptions.

Wildlife Habitat

The Forest Plan conservation biology strategy, including all species-specific standards and guidelines, is considered sufficient to maintain habitat for viable populations for all species potentially within the Project Area.

Each alternative complies with the Forest Plan conservation biology strategy designed to ensure well-distributed viable populations of wildlife.

The small Old-growth Habitat Reserves (Old-growth Habitat Land Use Designation) mapped in the Forest Plan Final EIS are required to be evaluated for size, spacing, and habitat composition. One small Old-growth Habitat Reserve has been evaluated with interagency involvement. There are no recommendations to adjust small Old-growth Habitat Reserves at this time because 67% of the VCU is in productive old growth Non-development Land Use Designation.

Alternatives Considered in Detail

The Proposed Action (Alternative C) and two other alternatives are considered in detail. Alternative A is the no-action alternative, under which the Project Area would have no timber harvest or road construction at this time, and would remain subject to natural changes only. Alternatives B and C represent different means of satisfying the purpose and need, by responding with different emphases to the significant issues discussed in Chapter 1. Fold-out color maps of all alternatives considered in detail are provided at the end of Chapter 2. Larger-scale maps of the alternatives are contained in the project planning record.

Alternative A (No-action)

The emphasis of this alternative is to propose no new timber harvest or road construction from the Emerald Bay Project Area at this time. It does not preclude timber harvest from other areas at this time, or from the Emerald Bay Project Area at some time in the future. The two small Old-growth Habitat Reserves adjacent to the Project Area would remain in their current locations, as mapped in the Forest Plan. The Council on Environmental Quality (CEQ) regulations (40 CFR 1502.14d) require that a "No Action" alternative be analyzed in every EIS. This alternative represents the existing condition against which all other alternatives are compared. The Alternative A (Existing Condition) map shows the distribution of vegetation associated with no new timber harvest.

Alternative B

The emphasis of this alternative is to progress toward the desired future condition for timber management while meeting Forest Plan Standards and Guidelines for other resources. Timber volume made available is maximized in this entry under this alternative. This alternative is designed to evaluate the economics and effects of harvesting using road access and conventional cable yarding systems wherever possible. This alternative serves as an upper level benchmark that can be used to project the cumulative effects of the reasonably foreseeable future activities within the Project Area.

Alternative B would harvest 699 acres of commercial forest land in 8 harvest units producing 14-16 million board feet (MMBF) of timber. New road construction totals 6.2 miles.

The average size of harvest units is 87.3 acres.

Alternative B could be divided into two timber sales. The first sale would build the roads and use conventional harvest systems to harvest approximately 10 MMBF. A second sale would harvest the remaining approximately 5 MMBF using helicopter yarding. However, a single sale may be the most economically desirable. Average harvest costs would be $281 per MBF.

After harvest activities are completed, all new project roads would be closed under the Emerald Bay Access Management Plan.

Table 2–1
Alternative B—Harvest Objectives and Practices

Category	Unit or Measure	Amount
Harvest Method		
Clearcut	acres	492
Individual Tree Selection	acres	207
Group Selection	acres	0
Harvest Volume*	MMBF**	14–16
Harvest System*		
Running Skyline	acres	396
Other Cable	acres	103
Helicopter	acres	182
Shovel	acres	18
Roads		
New Construction	miles	6.2
LTF Construction	#	1
Economics		
Total Project Cost	millions	$4.2
Average Harvest Cost	$/MBF	$281
Net Stumpage Value***	$/MBF	$206
Harvest per Mile of Road	$/MBF	2.4
Employment	jobs/year	124

* excluding additional right-of-way volume
** MMBF = million board feet
*** at High market prices

Alternative C (Preferred)

The objective of this alternative is to emphasize uneven-aged management by using selective harvest methods rather than even-aged clearcuts. The location of harvest units, the selection of silvicultural prescriptions, and the use of helicopter logging is an attempt to meet the objectives set forth in the Chapter 1 Purpose and Need. This approach seeks to eliminate road construction, provide timber volume, gather information on long-distance helicopter harvesting, and maintain the integrity of large, unfragmented blocks of old-growth forest to the extent practicable.

Alternative C would harvest 746 acres of commercial forest land in 10 harvest units producing 8-12 million board feet (MMBF) of timber.

The average unit size is 74.6 acres.

Alternative C would be a single timber sale. Average harvest costs would be $485 per thousand board feet (MBF). Alternative C builds no new road.

Table 2–2
Alternative C—Harvest Objectives and Practices

Category	Unit or Measure	Amount
Harvest Method		
Clearcut	acres	0
Individual Tree Selection	acres	720
Group Selection	acres	26
Harvest Volume	MMBF**	8–12
Harvest System		
Running Skyline	acres	
Other Cable	acres	
Helicopter	acres	746
Roads		
New Construction	miles	0
LTF Construction	#	0
Economics		
Total Project Cost	millions	$4.85
Average Harvest Cost	$/MBF	$485
Net Stumpage Value***	$/MBF	$(4)
Employment	jobs/year	82

** MMBF = million board feet
*** at High market prices

Comparison of Alternatives

This section compares outputs, objectives and effects of the alternatives in terms of the significant issues for the Emerald Bay Project. The discussions of effects are summarized from Chapter 3; for a full understanding of the effects, Chapter 3 should also be read. The table below provides an overview comparison of information from the alternative descriptions. This information will be used in the discussions which follow.

Table 2–3
Comparison of Action Alternatives—Outputs, Objectives and Effects

Category	Unit or Measure	Alt. A	Alt. B	Alt. C
Harvest Method				
Clearcut w/reserves	acres	0	492	0
Partial Cut	acres	0	207	720
Group Selection	acres	0	0	26
Harvest Volume*	MMBF**	0	14–16	8–12
Harvest Units				
Number of Units	#	0	8	10
Average Unit Size	acres	0	87.3	74.6
Harvest System*				
Running Skyline	acres	0	396	0
Other Cable	acres	0	103	0
Helicopter	acres	0	182	746
Shovel	acres	0	18	0
Harvest of Key Habitats				
High-vol. Old-growth	acres	0	427	427
Old-growth < 1,200 ft.	acres	0	312	336
Roads				
New Construction	miles	0	6.2	0
LTF Construction	#	0	1	0
Economics				
Total Project Cost	millions	0	$4.2	$4.85
Average Harvest Cost	$/MBF	0	$281	$485
Net Stumpage Value***	$/MBF	0	$206	$(4)
Harvest/Mile of Road	MMBF	0	2.4	0
Employment	jobs/year	0	124	82

* excluding additional right-of-way volume
** MMBF = million board feet
*** at High-market prices

Issue 1: Timber Sale Economics

Alternative A proposes no timber harvest, and thus offers no opportunity for timber-related employment or personal income. The action alternatives would result in timber-related employment opportunities in direct proportion to their total harvest volumes. Alternative B offers the most timber volume (14-16 MMBF) and generates the highest potential number of jobs (124). These amounts are somewhat more than Alternative C (8-12 MMBF and 82 jobs).

Issue 2: New Road Construction

Alternative B, which has road construction and conventional harvest, has the lowest average overall cost ($281 per MBF). Alternative C has the highest average cost, which at $485 per MBF is substantially higher than the other action alternative. These costs are largely related to long-distance helicopter yarding.

Alternative A and C have no new road construction. Alternative B constructs 6.2 miles of new road, constructs one LTF and bisects a medium Old-growth Reserve with 2.2 miles of road.

The potential long-term effects of the new road construction in Alternative B will be reduced through implementation of an access management plan for the Emerald Bay Project Area. This plan will close all newly-constructed roads at the end of the project. The access management strategy is to address and reduce, through road closures, some of the effects on wildlife and wildlife habitats, fisheries, and water quality.

Comparing the benefits and adverse effects of each alternative against the issues, the Forest Service has identified Alternative C as the Preferred Alternative in this Draft EIS. A final selection of an alternative will be made by the Forest Supervisor in the Record of Decision (ROD) following completion of a Final EIS.

Mitigation Measures

Many of the resource concerns raised during scoping, interagency discussions, and subsequent analysis did not become significant issues driving alternative development. Some of these concerns were addressed by eliminating potential harvest units from consideration at this time, and others have been, or will be, addressed during the design and implementation of the proposed activities. For example, various resource standards and guidelines from the Forest Plan, and the applicable BMPs used to meet requirements of the Clean Water Act, are automatically applied when potential harvest units or roads are located and designed. Also, based on resource analysis and/or interdisciplinary work, additional mitigation measures can be applied for specific proposed activities. An example of these mitigation measures includes:

- Road construction is allowed in wetlands, but minimized.

Additional mitigation measures can be found on the unit and road cards (Appendices B and C).

Monitoring

Monitoring activities can be divided into three broad categories: Forest Plan monitoring, routine implementation monitoring, and project-specific effectiveness monitoring. The National Forest Management Act requires that National Forests monitor and evaluate their forest plans (36 CFR 219.11). The Forest Plan (Chapter 6) includes the monitoring and evaluation activities to be conducted as part of Forest Plan implementation.

Routine Implementation Monitoring

Routine implementation monitoring assesses whether the project was implemented as designed and whether or not it complies with the Forest Plan. Planning for routine implementation monitoring began with the preliminary design of harvest units and roads (see previous discussion of mitigation). The unit and road cards (Appendices B and C) will be the basis for determining whether recommendations were implemented for various aspects of the

Emerald Bay Project.

Routine implementation monitoring is part of the administration of a timber sale contract. The sale administrators and road inspectors ensure that the prescriptions contained on the unit and road cards are incorporated into contract documents and then monitor performance relative to contract requirements. Input by resource staff specialists, such as fisheries biologists, soil scientists, hydrologists and engineers, is regularly requested during this implementation monitoring process. These specialists provide technical advice when questions arise during project implementation.

Tongass staff and representatives from other Federal and State Agencies annually conduct an interdisciplinary review of BMP implementation and effectiveness. The results of this and other monitoring are summarized in Tongass National Forest Annual Monitoring and Evaluation Reports. This report provides information about how well the management direction of the Forest is being carried out, and measures the accomplishment of anticipated outputs, activities and effects.

Project-specific Effectiveness Monitoring

Effectiveness monitoring seeks answers about the effectiveness of design features or mitigation measures in protecting natural resources and their beneficial uses. Monitoring records will be kept by the responsible staff. At this time, no project-specific effectiveness monitoring needs have been identified for the Emerald Bay Project.

Forest Plan level Effectiveness Monitoring

Effectiveness monitoring and evaluation is used to determine whether standards and guidelines are achieving objectives, whether objectives are achieving goals, and includes and evaluation on whether there are significant changes in productivity of the land.

Forest Plan level Validation Monitoring

Validation monitoring and evaluation is used to examine whether the assumptions and predicted effects used to formulate the plan are accurate.

Chapter 3

Affected Environment and Environmental Consequences

Chapter 3

Affected Environment and Environmental Consequences

Introduction

This chapter provides information concerning the existing environment of the Emerald Bay Project Area, and the potential consequences to that environment. It also presents the summary of scientific and analytical basis for the comparison of alternatives presented in Chapter 2. Each resource potentially affected by the Proposed Action or alternatives is described by its current condition and uses.

Following each resource description is a discussion of the potential effects (environmental consequences) to the resource associated with the implementation of each alternative. All significant or potentially significant effects, including direct, indirect and cumulative effects, are disclosed. Effects are quantified where possible, and qualitative discussions are also included. The means by which potential adverse effects will be reduced or mitigated are described.

The discussions of resources and potential effects take advantage of existing information included in the Forest Plan EIS, other project EISs, project-specific resource reports and related information, and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record for the Emerald Bay Project includes all project-specific information, including resource reports, the watershed analysis, and other results of field investigations. The record also contains information resulting from public involvement efforts. The planning record is located at the Ketchikan–Misty Fiords Ranger District Office in Ketchikan, Alaska, and is available for review during regular business hours. Information from the record is available upon request.

Land Divisions

The land area of the Tongass National Forest has been divided in several different ways to describe the different resources and allow analysis of how they may be affected by Forest Plan and project-level decisions. These divisions vary by resource since the relationship of each resource to geographic conditions and zones also varies. The allocation of Forest Plan land use designations (discussed in Chapter 1) is one such division. Two divisions important

for the present effects analysis are described briefly here.

Value Comparison Units (VCUs)

These are distinct geographic areas, each encompassing a drainage basin containing one or more large stream systems. The boundaries usually follow major watershed divides. The Emerald Bay Project Area consists of one VCU, number 721, as discussed in Chapter 1. Chapter 1 also includes a map showing the location.

Wildlife Analysis Areas (WAAs)

These are Forest Service land divisions that correspond to the "Minor Harvest Areas" used by the Alaska Department of Fish and Game. Approximately 190 apply to the Tongass National Forest. WAA 1817 corresponds to the Emerald Bay Project Area. Information estimated by WAA is used in the wildlife and subsistence analyses.

Analyzing Effects

Environmental consequences are the effects of implementing an alternative on the physical, biological, social and economic environment. The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) include a number of specific categories to use for the analysis of environmental consequences. Several are applicable to the analysis of the proposed project and alternatives, and form the basis of much of the analysis which follows. They are explained briefly here.

Direct, Indirect and Cumulative Effects

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but would be significant in the foreseeable future. Cumulative effects result from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time.

Unavoidable Adverse Effects

Implementation of any action alternative would cause some adverse environmental effects that cannot be effectively mitigated or avoided. Unavoidable adverse effects often result from managing the land for one resource at the expense of the use or condition of other resources. Many adverse effects can be reduced, mitigated, or avoided by limiting the extent or duration of effects. The interdisciplinary procedure used to identify specific harvest units and roads was designed to eliminate or lessen the significant adverse consequences. The application of Forest Plan Standards and Guidelines, Best Management Practices, project-specific mitigation measures, and monitoring are all intended to further limit the extent, severity, and duration of potential effects. Such measures are discussed throughout this chapter. Regardless of the use of these measures, some adverse effects will occur. The purpose of this chapter is to fully disclose these effects.

Short-term Use and Long-term Productivity

Short-term uses and their effects are those that occur annually or within the first few years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project has been implemented. Under the Multiple-Use Sustained Yield Act, and the National Forest Management Act, all renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be reestablished and grown again if the long-term productivity of the land is maintained. This long-term productivity is maintained through the application of the resource protection measures just described, in par-

ticular those applying to the soil and water resources. These are also discussed throughout the chapter.

Irreversible and Irretrievable Commitments

Irreversible commitments are decisions affecting non-renewable resources such as soils, wetlands, unroaded areas, and cultural resources. Such commitments are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at a great expense, or because the resource has been destroyed or removed. The construction of roads for timber harvesting is an irreversible action because of the time it takes for a constructed road to revert to natural conditions. The conversion of old-growth forest to a managed second-growth stand may also be considered an irreversible commitment.

Irretrievable commitments represent opportunities foregone for the period during which resource use or production cannot be realized. Such decisions are reversible, but the production opportunities foregone are irretrievable. As an example, deferring timber harvest at this time in certain areas due to resource concerns or economics would be an irretrievable commitment of timber volume otherwise obtainable. The commitment is irretrievable rather than irreversible, because future entries could harvest those areas if they are still part of the suitable timber base. Irreversible and irretrievable commitments are not usually identified as such in the resource discussion of this chapter.

Available Information

Much of the Tongass National Forest resource data resides in an electronic database formatted for a geographic information system (GIS). GIS software is used to assist in the analyses of these data. GIS data is available in tabular (numerical) format, and as plots displaying data in map format. For this Draft EIS, all the maps, and most of the numerical analyses, are based on GIS resource data.

There is less than complete knowledge about many of the relationships and conditions of wildlife, fish, forests, jobs and communities. The ecology, inventory and management of a large forest area is a complex and developing science. The biology of wildlife species prompts questions about population dynamics and habitat relationships. The interaction of resource supply, the economy, and communities is the subject matter of an inexact science. However, the basic data and central relationships are sufficiently well established in the respective sciences for the deciding official to make a reasoned choice between the alternatives, and to adequately assess and disclose the possible adverse environmental consequences. New or improved information would be very unlikely to reverse or nullify these understood relationships.

Other Resources

Several resources and uses of the Project Area are likely to remain unaffected by the Proposed Action or alternatives, or will not be affected to a significant degree. Even though significant effects are not anticipated, most of these resources are discussed in the sections of this chapter which follow the introduction, to the extent that measurable effects or differences between alternatives are present. Resources or uses for which no measurable effects were identified are discussed briefly here.

Air Quality

All of the action alternatives will have limited, short-term effects on ambient air quality. Such effects, in the form of vehicle emissions and dust, are likely to be indistinguishable from other local sources of airborne particulates, including other motor vehicle emissions, dust from road construction and motor vehicle traffic, residential and commercial heating sources, marine traffic, and emissions from burning at sawmills. The action alternatives

could result in short-term supplies of raw wood products to local mills. It is the responsibility of the mill owner or sort yard operator to ensure that mill emissions are within legal limits.

Facilities

There are no logging camps or Forest Service administrative sites in the Emerald Bay Project Area. The Ketchikan–Misty Fiords Ranger District is located approximately 40 miles south of the Project Area in Ketchikan, Alaska.

Heritage Resources

The Emerald Bay Project Area is located on the Cleveland Peninsula, where considerable archaeological survey has been conducted which has added significantly to our understanding of the chronology of human occupation and patterns of subsistence. In recent documentation, this steep section of the coast appears to have received little use by Native people. According to Goldschmidt and Haas (1946), who conducted interviews with Native people in an effort to determine traditional land-use patterns, the Emerald Bay Project Area is located within the traditional territory of the Kiks'adi people of the Stikine area, which was used for subsistence activities. A single notation in the literature indicating cultural use of Emerald Bay was located in T.T. Waterman's 1926 report "Tlingit Geographical Names for Extreme Southeast Alaska." Waterman listed in his field notes a portage trail from Spacious Bay on the east coast of Cleveland Peninsula to Emerald Bay. No cultural resource sites have been previously identified within the Emerald Bay Project Area.

Most of the planned management activities in the Emerald Bay Project Area fall in low-sensitivity areas for cultural resources as defined in the 1995 agreement (#95MOU-10-029): they lie at elevations above 100 feet and do not possess other characteristics which would suggest focused historic or prehistoric activities. Field investigations were concentrated within areas of higher potential for locating significant cultural resource sites along the coast and estuaries including the proposed LTF location. The possibility that significant historic properties exist within the Area of Potential Effects for this project is very low. The Alaska State Historic Preservation Officer concurred with the recommendation that no significant cultural resource sites would be affected by the proposed activities based upon the literature review and subsequent field investigations. Clearance will be recommended based on this study.

Land Status

Under the Alaska Statehood Act of 1959, the State of Alaska is entitled to a certain amount of Federal land. The State was also allowed to identify for selection more acreage than would ultimately be conveyed to State ownership. Other legislation granted Alaska Native corporations similar selection rights. There are no State or Alaska Native land selections or claims within the Project Area.

Minerals

There are no known mineral occurrences of commercial value within the Emerald Bay Project Area. Bureau of Land Management records indicate no mining claims or patented mining claim groups within the Emerald Bay Project Area.

The Proposed Action would have no direct or indirect impact on mineral resources. In general, the project could affect mining activities only by providing easier access for mapping and surveying due to new road construction in less developed or underdeveloped areas. Geologic mapping could also be enhanced by increased exposure due to road construction and quarry development.

Plans of Other Agencies

The CEQ regulations implementing NEPA require a determination of possible conflicts between the Proposed Action and the objectives of Federal, State, and local land use plans, policies, and controls for the area. The major land-use regulations of concern are Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA), the Coastal Zone Management Act (CZMA), and the State of Alaska's Forest Practices Act. ANILCA Section 810 requirements pertain to subsistence; these are discussed in the Subsistence section of this chapter.

The CZMA was passed by Congress in 1976 and amended in 1990. This law requires Federal agencies conducting activities or undertaking development affecting the coastal zone to ensure that the activities or developments are consistent with approved State coastal management programs to the maximum extent practicable. The State of Alaska passed the Alaska Coastal Management Act in 1977, to establish a program that meets the requirements of the CZMA. In 1990 the State passed a revised Alaska Forest Practices Act. For Federal timber sales, the Forest Practices Act provides the standards to be used for a determination of consistency with the Alaska Coastal Management Act. It also provides specific stream buffer requirements.

The Forest Service has evaluated the alternatives to ensure that the activities and developments affecting the coastal zone are consistent with approved coastal management programs to the maximum extent practicable. The Forest Plan Standards and Guidelines, and management practices incorporated into the Emerald Bay Project meet or exceed those indicated by the Alaska Coastal Management Act and the Alaska Forest Practices Act. The layout of all proposed harvest units will comply with Forest Plan Standards and Guidelines for riparian management areas, which meet or exceed the stream buffer requirements in the Forest Practices Act.

3 Environment and Effects

Biodiversity and Old-growth

Affected Environment

Biological Diversity

National Forest Management Act (NFMA) regulations (36 CFR 219) define diversity as the distribution and abundance of different plant and animal communities and species. Biological diversity, or biodiversity, refers not only to the variety of organisms in an area, it also includes their genetic composition, the complex pathways that link organisms to one another and to the environment, and the processes that sustain the whole system. Biodiversity can be evaluated at different scales, ranging from genetic and species diversity to landscape diversity.

The risk of genetic and species loss is higher if the structure, composition, or function of habitats are compromised. An example of such a compromise might be fragmentation of large blocks of suitable habitat into smaller isolated blocks that separate small populations of wildlife species from each other. In managing forest ecosystems, biodiversity is evaluated at larger scales because the maintenance of functioning ecosystems will better conserve the species associated with them.

The connectivity, or habitat corridors, between habitat blocks in a landscape can be very important for maintaining diversity (Noss 1983). Corridors can function in different ways, depending on width and other characteristics. Corridor width can be important: some "interior species" (species that do not inhabit the outer edges of old-growth forests) will not live in or even migrate through extensive lengths of unsuitable habitat (Forman and Gordon 1981).

100–Year Viability Analysis

Project Level Viability Analyses

The Forest Plan EIS conducted viability analyses and concluded that the revised Forest Plan, as approved, will provide reasonable assurance of maintaining viable and well-distributed populations of wildlife across the Tongass National Forest for 100 years. This analysis and conclusion incorporated the assumption of full implementation of the Forest Plan for 10 decades (harvest of all suitable acreage and conservation measures taken during project planning). The TLRMP Record of Decision (April, 1999) modifying the Forest Plan provided additional protection for large tracts, including most of the Cleveland Penninsula. Therefore, any project that is consistent with the Forest Plan is a subset of the forest-wide analysis and will, by definition, also provide reasonable assurance of maintaining viable wildlife populations.

This project is consistent with the Forest Plan land allocations and Standards and Guidelines. Viability analyses are not required at the project level. New information has not emerged since the Forest Plan revision was completed that would cast doubt on or significantly alter the original analysis. Within the 5-year timeframe of the mandated Forest Plan review and the commitment to review the old-growth strategy, new information should be available to conduct the review of population viability. During that review, conclusions may change. However, it is unlikely that before then, e.g. on an annual basis, any new information would be significant enough to modify the 100-year viability analysis conclusion.

Old-growth Forest

Old-growth forest contains trees of many ages, sizes, and conditions, including dead standing trees (snags) and trees with dead tops. Tree establishment largely depends on large woody debris (logs and stumps) (Harmon 1986, Harmon and Franklin 1989) and gap formation

(Alaback 1988). Woody debris provides microsites for seedlings to grow on, and gaps (openings) created by windthrow or other disturbances allow light to penetrate to the forest floor. The process of trees dying and being replaced is continuous; in any one year, a portion of the trees in individual stands are likely to blow down (Harris 1989). Generally, the forest is a mosaic of older and younger trees, dynamically changing yet remaining stable as a forested ecosystem (Bormann and Likens 1979, Alaback 1988, Schoen et al. 1988, Franklin 1990).

Old-growth forest can be an important source of valuable forest products. All action alternatives propose harvesting old-growth forest. Old-growth forests are also important for aesthetic and cultural purposes. Large trees, characteristic of many old-growth stands, have become symbols of a "pristine" landscape.

Old-growth forest is also important as wildlife habitat for old-growth associated species such as Sitka black-tailed deer, marten, black bears, Vancouver Canada geese, and cavity or snag-dependent species such as flying squirrels, woodpeckers, and owls. The combination of a dense canopy with scattered small openings (typically 20 to 40 feet across) allows forage to grow under the openings, while the large limbs within the canopy intercept enough snowfall to provide winter food and thermal cover for deer and other species. The large, dense stems also provide some measure of thermal insulation in the winter. Large dead or defective trees provide nesting sites for marten, owls, eagles, wrens and chickadees, as well as feeding sites for woodpeckers, sapsuckers, brown creepers and others.

The value of old-growth forest for wildlife habitat transcends individual stands. Large, contiguous, unfragmented blocks of old-growth forest are important to forest interior species. Large old-growth blocks provide expansive hunting territories and protection from predators, and promote genetic mixing among populations that would be less likely to breed if they were spatially separated by forest fragmentation. Deer use these large old-growth blocks for migration routes between winter and summer ranges.

The Project Area received approximately 14 acres of timber harvest about 65 years ago, near the beach in Emerald Bay. Currently, the forests on the Project Area have a relatively (naturally) fragmented distribution. The majority (74 percent) of the productive old growth (Table OG-1) and the largest forest blocks in the Project Area are in the medium Old-growth Reserve (Figure OG-1).

The last column of the table represents the commercial old-growth forest that will be remaining at the end of the first rotation in land use designations classified as unavailable or unsuitable for timber management.

Table Old-growth-1
Productive Old-growth Forest Acres in Emerald Bay Project Area

POG* (1954)	POG (1998)	POG (2054)
5,274	5,260	4,303

* POG = productive old-growth (suitable and unsuitable)

Viable Populations and Old-growth

The NFMA regulations also include the concept of wildlife (vertebrate) species viability, requiring that fish and wildlife habitats be managed to maintain viable populations of species in the planning area (National Forest). A viable population is defined as one having "the

estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area" (36 CFR 219.19). Wildlife habitat planning and management for viable populations is carried out in the context of overall multiple-use objectives.

Viability is discussed here rather than in the Fisheries Resources and Wildlife sections due to the key role that old-growth forest habitat plays in maintaining viability across the Tongass National Forest. The Forest Plan includes, as the foundation of its viability strategy, a forest-wide system of Old-growth Habitat Reserves (blocks) that maintain the integrity of the old-growth ecosystem.

Under the Forest Plan, Project Areas are not expected to independently maintain viable populations, but do need to consider project-level contributions to the forest-wide strategy. This includes maintaining the integrity of Old-growth Habitat Reserves, maintaining other components of the overall strategy (such as riparian management areas, the beach and estuary fringe, and species-specific habitats), and considering additional old-growth habitat and corridor needs within the Project Area.

The Emerald Bay Project Area (VCU 7210) contains part of a medium Old-growth Habitat Reserve. This medium Old-growth Reserve makes up 67 percent of the Project Area. The Project Area is bounded on the south by the remainder of the same medium reserve and part of a small Old-growth Habitat Reserve. The Project Area is bounded on the east by the remainder of the same small Old-growth Habitat Reserve (Table OG-2). The Forest Plan allows boundary adjustments or relocations (within a VCU) of small reserves, as long as the habitat criteria are met. (Proposed changes to small Old-growth Habitat Reserves are discussed below under "Effects of the Alternatives.") .

Table Old-growth-2
Old-growth Habitat Reserve Acreage in Emerald Bay Project Area

VCU	VCU Acres	Old-growth Habitat Reserve Acres	POG* in Reserve (acres)
7,210	7,845	5,259	3,913

* POG = productive old-growth

The maintenance of habitat corridors can be important to minimize isolation and decline of wildlife species associated with the old-growth blocks (Harris 1984, 1985; Hunter 1990). Riparian areas, the beach fringe, estuaries and other areas (including stands deemed inoperable for timber harvest because of unstable soils, steep slopes, economic isolation, or other factors) can all provide connectivity between old-growth blocks in addition to Old-growth Habitat Reserves. Very limited timber harvest (14 acres) has occurred in the past within the beach, estuary, and riparian buffers in the Project Area.

Effects of the Alternatives

Effects of Alternatives on Old-growth Forest and Biodiversity

Following clearcut logging of old-growth forest, the stands that subsequently develop are even-aged (Harris and Farr 1974) and tend to contain a higher percentage of Sitka spruce and a lower percentage of cedars. Clearcutting differs from natural disturbances in that it represents a large-scale change (up to 100 acres, typically) rather than dispersed small (one to 20 acres, typically) partial blowdown patches. It also differs in that nearly all trees are felled, whereas in natural disturbances many trees remain standing or partially standing (Hansen et al. 1991).

Direct Effects

Under Alternative B, about 699 acres would be harvested by clearcut and partial harvest methods (Table OG-3). About 492 acres would be clearcut harvested, although this will differ somewhat from traditional clearcutting because 10-20 percent of the original stand structure of each unit that contains high-value marten habitat will be retained. The retained trees will most likely be in clumps or "islands" within a unit, or may be more evenly spaced. In either case, the actual opening created will be smaller than the unit size indicates, and mature trees will remain as part of the unit. There will be 12 clearcut sub-units with an average size of 41 acres. There will be 10 partial harvest sub-units with an average size of 21 acres under Alternative B. Under Alternative C, all 746 acres (13 sub-units) would be partial harvested and helicopter yarded. Alternative B has more sub-units (22) of smaller average size (32 acres) when compared to Alternative C (Table OG-3), however, Alternative B will have 12 clearcut openings that will be relatively large when compared to Alternative C.

Table Old-growth-3
Emerald Bay Harvest Acreage and Unit Size by Alternative

Alternative	Number of Sub-Units	Average Unit Size (acres)	Clearcut (acres)	Partial Harvest (acres)	Total (acres)
A	0	0	0	0	0
B	22	32	492	207	699
C	13	57	0	746	746

Indirect and Cumulative Effects

Table OG-4 portrays the amount of old-growth forest harvested to date within the Project Area, and gives an estimate of the productive old growth originally existing there. Comparing these two figures gives an indication of the cumulative effect (as a reduction) on the old-growth forest resource in the Project Area so far.

Table OG-4 displays the cumulative change (reduction) in Project Area high-volume old-growth forest, as a percentage of that existing in 1954. Included are both the percentage harvested to date (which is the same for all alternatives), and the percentage resulting from the additional harvest under each Emerald Bay action alternative.

Table Old-growth-4
Cumulative Reduction in Emerald Bay Project Area High-Volume Old-growth: Percentage of 1954 Productive Old-growth Forest Harvested

	Alt. A	Alt. B	Alt. C	As of 2054
1954	2,366	2,366	2,366	2,366
Post Project	2,366	2,053	2,033	1,939
Percent Reduction	0 percent	13 percent	14 percent	18 percent

An analysis of cumulative effects must also include "reasonably foreseeable future actions" (40 CFR 1508.7). For the Emerald Bay Project action alternatives, individual sale offerings are likely to occur over the next 10 years, and harvest activities may extend beyond that time. These are the only projects being planned for this area at this time. Therefore, the foregoing discussion of cumulative effects has included the reasonably foreseeable future actions.

To further address cumulative effects, potential harvest in the Emerald Bay Project Area over the next 5 decades can be projected, on the assumption that the remaining available productive old growth will be harvested during that time. There are currently 957 acres of suitable productive old growth available for harvest scheduling (see Silviculture and Timber Management section of this chapter), of which the project alternatives would harvest between 699 and 746 acres, but assuming all are harvested by the end of 5 decades (by about 2054), this would reduce the productive old-growth forest in the planning area to 59 percent of what existed in 1954 (Table OG-4).

Effects Related to Viable Populations and Old Growth

The Forest Plan, as previously discussed, includes a forest-wide habitat conservation strategy designed to provide reasonable assurance of maintaining adequate habitat to maintain viable fish and wildlife populations. For the Emerald Bay Project Area, the medium Old-growth Habitat Reserve is the main component of the forest-wide habitat conservation system. In addition, all applicable Forest Plan Standards and Guidelines that are also integral parts of the strategy - such as riparian management areas, beach fringe protection, landscape connectivity, and marten guidelines - are fully incorporated into the Emerald Bay action alternatives.

The Forest Plan includes specific criteria for designing and locating small, medium and large Old-growth Habitat Reserves (Forest Plan, Appendix K). As discussed earlier, the small Old-growth Habitat Reserves identified and mapped for the Forest Plan are anticipated to be reviewed during project-level planning, and are subject to change to improve their functioning in the overall reserve system. The small Old-growth Habitat Reserves adjacent to the Project Area were reviewed during interagency and interdisciplinary meetings. No changes are proposed for the small reserve in VCUs 5260 or 7220 (Table OG-5).

Table Old-growth-5
Comparison of Mapped Small Old-growth Habitat Reserves

	VCU 5260	VCU 7220
Small Reserve Acres:		
Forest Plan (1997)	3,574	8,811
Required (min.)	2,817	5,050
Proposed Change	none	none
POG* Acres:		
Forest Plan (1997)	1,907	2,964
Required (min.)	1,408	2,525
Proposed Change	none	none

* POG = productive old-growth

Comparison of Alternatives

Alternative A is the no-action alternative and will result in no harvest. Similar acreages will be harvested under Alternative B (699 acres) and Alternative C (746 acres). Under Alternative B, 492 acres will be clearcut harvested and 207 acres will be partial harvested. Alternative B will also construct 6.2 miles of roads. Under Alternative C, all 746 acres will be partial harvested. The partial harvesting targets are to remove 50 percent of the trees and/or 50 percent of the basal area of a treated sub-unit. Alternative B will remove 34-47 percent more of the trees and/or basal area from the Project Area. Alternative B will also result in 12 openings (clearcuts) that will average 32 acres in size (depending on how much canopy cover is left to meet Marten Standard and Guidelines).

All harvest units with high-value marten habitat are designed to retain at least 10-20 percent canopy closure consistent with the American Marten Standard and Guidelines.

Fisheries Resources

The following descriptions and analysis are summarized from the Emerald Bay Planning record documents: the Fish and Water Resource Report (1999), and the Soils and Water report for the Emerald Bay Project Area (1999). A related analysis of fisheries is contained in the Forest Plan, Chapter 3. Applicable fisheries and riparian direction is contained in the Forest Plan, Chapter 4 and Appendices D and J. The unit and road cards contain site specific implementation requirements and mitigation measures (Appendices C and D). More detailed descriptions of fisheries resources associated with each potential harvest unit are available in the unit reports.

Affected Environment

Fish Species and Uses

Project Area streams contain important anadromous and resident fish habitats. The streams support three species of anadromous salmon (pink, chum, and coho), as well as resident coastal cutthroat trout, and Dolly Varden char. King salmon are present in the inlets and bays of the Project Area, but do not spawn in Project Area streams. Salmon, trout and char are important to the subsistence, sport and commercial fisheries of the region, and are a major food source for many wildlife species when present. Alaska Department of Fish and Game does not issue Personal Use Permits for the fresh waters of the Project Area. Emerald Creek contributes to the commercial fisheries of the Southeast Alaska.

Fish Habitat

Fish habitat can be described by watershed, stream class, and process group (stream channel typing). Floodplains, the most important process group relative to fish habitat, are discussed in the Water section of this chapter. Watersheds are areas that collect and discharge runoff through a given point on a stream. The Emerald Bay Project Area includes two separate watersheds, Wasta (C72C) and Emerald Bay (C70A). Over 75 percent of the Project Area is located in the Emerald Bay Watershed. There are less than 20 acres of lake habitat in the Emerald Bay Project Area. The 18 acre lake in the Birch Creek sub-basin has an elevation of 950 feet and does not contain fish.

Fish habitat in the Project Area was analyzed at the landscape and watershed levels. Water issues are discussed in the Chapter 3 Water section. Fish habitat was analyzed at the landscape scale using estimates of fish habitat availability (miles of fish-bearing streams in a watershed) and capability (ability by a watershed to produce smolts). Estimates were compared against fish habitat estimates made for similar-sized watersheds (at least 3rd-order and > 1.0 sq. mi.) across the Cleveland Peninsula. Emerald Bay fish habitat availability estimates were slightly above average. Potential capability to produce salmon smolts was slightly above average for salmon, and slightly below average for Dolly Varden. The fish habitat is slightly above average when compared against similar watersheds across the Cleveland Peninsula landscape. On the Cleveland Peninsula, the majority of salmonid habitat and salmonid production occurs in Vixen, Port Stewart, Black Bear, and Wasta watersheds.

The Emerald Bay watershed was divided into four sub-basins for sediment risk analysis. The most sensitive resident salmonid habitat in the watershed is located in sub-basin S01 (upper Birch Creek) where four Class III tributaries join an unstable palustrian complex at the upper mainstem floodplain. Harvest surrounding this area was deferred.

The Emerald Bay Project Area encompasses one sub-basin of the Wasta drainage. The single Wasta sub-basin located within the Project Area is part of a low elevation divide and is relatively flat. A small pond (less than 3 acres) and a narrow (<3 feet) Class II stream (field ver-

ified) drain this sub-basin. Any potential harvest areas in the Wasta watershed will implement Forest Plan Standards and Guidelines (S&G) buffers. Because any proposed harvest will fully implement S&G buffers, and because the sub-basin has low relief, sediment risk to fish habitat and water quality in the Wasta watershed is expected to be negligible.

There are 15.3 miles of streams in the Project Area, with 14.7 miles of streams in the Emerald Bay watershed (See Table Fisheries-1).

Table Fisheries-1
Number of Stream Miles by Stream Class in Emerald Bay Watershed

Class I	Class II	Class III	Class IV	Total
2.5	3.5	4.6	4.1	14.7

Existing Harvested Areas and Road Crossings

Timber harvest and roads are typically the forest management activities with the highest potential to adversely affect fisheries habitats. The Emerald Bay Project Area has had 14 acres of selective timber harvest. The harvest occurred approximately 60 years ago at the mouth of Emerald Creek (harvest age was determined by increment boring). Second growth is dominated by Sitka spruce and western hemlock with a few large alders along the creek. At diameter breast height (DBH), second-growth conifers measured 18 to 28 inches. Primarily Sitka spruce were removed from the floodplain (FP4 channel-type) just above the estuary. Harvest did not extend past the confluence of Emerald and Birch Creeks. During a reconnaissance in April 1998, large woody debris and pools were present in the channel, with several wood pieces spanning the creek and checking substrate. The FP4 reach and associated riparian is providing quality habitat for salmonids.

Environmental Consequences

Timber harvest activities have the potential to affect fisheries resources by altering fish habitat. Logging and associated road building can affect fisheries resources by changing the delivery of water, sediment, and input of large woody debris into the stream system. Changes of the input and transport of these components can adversely affect the capability of the stream habitat to produce fish. The closer the timber harvest activities are to a stream, the higher the risk of adversely affecting fish habitat.

Fish Habitat Protection Standards (Mitigation)

The National Forest Management Act implementing regulations prohibit any activities near streams which would seriously and adversely affect fish habitat (36 CFR 219.27 (e)). In addition, the Tongass Timber Reform Act of 1990 requires a no-harvest buffer zone of at least 100 feet on each side of all Class I streams, and all Class II streams that flow directly into Class I streams (section 103 (a)).

The Forest Plan Riparian (S&G) incorporate this direction and provide additional protections. The Riparian Standards and Guidelines require no-harvest buffers along all Class I, II and III streams, based on stream process groups and a defined Riparian Management Area, and provide guidelines for management beyond the no-harvest zone to provide for a reasonable assurance of windfirmness. Riparian (S&G) were specifically developed through a collaborative effort involving lead watershed and fisheries scientists from Federal (management and research) and State (Alaska Department of Fish and Game; ADEC) agencies. They are the measures established to avoid any additional impacts to aquatic resources from management activities and can only be modified through an approved, site-specific watershed analy-

sis. The Standards and Guidelines and other direction of the Forest Plan meet or exceed all of those recommendations by AFHA, and include some additional protections. These Standards and Guidelines are sufficient to protect fish habitat and provide for sport and commercial fisheries and subsistence.

Finally, the Best Management Practices (BMPs), designed to ensure compliance with the Clean Water Act, help protect riparian habitat on streams or portions of streams not protected by buffer zones. In order to minimize the potential for adverse impacts on soil and water resources by management activities, BMPs are used to directly or indirectly protect water quality from non-point source pollution. This is typically done through site-specific prescriptions.

Results of the Fish and Water Resource Report mentioned previously were used in the design of harvest units and the inclusion of additional mitigation measures. Areas where high risk was identified or indicated were avoided. If additional streams are found during project layout, the same standards and guidelines will be applied. Future monitoring will focus on the application and adequacy of buffer prescriptions.

Effects of Alternatives

Use of the measures just discussed all serve to substantially minimize potential effects to the Project Area fisheries resource. Measurable direct, indirect or cumulative effects to fisheries resources are not anticipated. The following discussions address the potential risk that unforeseen effects may still occur. It should be emphasized that this is only an indication of relative risk, not an estimation or expectation of adverse effects actually occurring.

Roads and Stream Crossings

Road construction and use often poses the greatest potential risk to riparian resources and fish habitat capabilities. Proposed road construction under Alternative B requires crossing streams to access timber harvest units. Roads can affect fish habitat through the introduction of fine sediment, increased landslide potential due to road location and design, and re-routing of sediment-laden water. Road construction also has the potential to affect upstream fish passage through improper placement or sizing of culverts.

The total number of stream crossings required by alternative are: Alternative A - 0; Alternative B - 7; Alternative C - 0. Alternative B is the only roaded alternative, with 6.2 miles of proposed road.

The road in Alternative B has been routed to minimize adverse impacts to fish habitat and the number of crossings needed. For site-specific information, see road cards (Appendix C).

Timber Harvest

Removal of riparian vegetation through timber harvest can affect fish habitat and fish populations by increasing sediment inputs into streams, changing stream temperature and dissolved oxygen levels, changing the input of large woody debris, and altering the delivery of water to streams. Alternative B proposes 699 acres for harvest treatment: 415 acres for clear-cut and 284 acres for partial-cut. Alternative C proposes 746 acres for harvest treatment, all uneven-aged management.

There will be no riparian area harvest along any Class I, II or III stream under any alternative. There is the possibility of loss of trees within riparian areas due to future windthrow; however, significant adverse effects to fish habitats or populations are not anticipated. Windthrow is discussed further in the Water section of this chapter.

Timber harvest may remove riparian vegetation to the streambank along Class IV streams included in harvest units. These are all non-fish-bearing streams, and water flows are often

intermittent or ephemeral. While these streams have insufficient flow or sediment transport capabilities to have an immediate influence on downstream water quality and fish habitat, they inevitably do introduce some sediment to streams. BMPs are applied to these streams, and they may also receive additional protection in the form of full suspension over the stream, directional felling, or split yarding, based on the physical characteristics of the stream and the need to protect streambank integrity. The miles of unbuffered Class IV streams by alternative are: Alternative A - 0 miles; Alternative B - 2.9 miles; Alternative C - 3.3 miles. For site-specific information, see unit cards (Appendix B).

Essential Fish Habitat

The potential effects of the Emerald Bay Timber Sale project on essential fish habitat have been evaluated. For specific information regarding essential fish habitat and the potential impacts, refer to the Emerald Bay Project Area Soils Report that evaluates landslide potential on streamcourses within the Project Area. Analysis completed in fish, water and soils indicates no significant changes to Riparian Management Areas (RMAs) and floodplain due to proposed management activities.

Heritage Resources

The Emerald Bay Project Area is located on the northwest portion of Cleveland Peninsula where considerable archaeological survey has been conducted. The surveys conducted for the Emerald Bay Timber Sale Draft EIS, in conjunction with the surveys for the Yes Bay/Mink Bay Land Exchange and the Smugglers Cove Recreation Shelter and Trail and the Cleveland Peninsula EIS surveys have added significantly to our understanding of the chronology of human occupation and patterns of subsistence on the Cleveland Peninsula.

Affected Environment

The Cleveland Peninsula occupies an important place in the traditions of the Tlingit people. Port Stewart, which was called Ganax or "safe, sheltered bay" (Emmons, 1916) is considered important to the Ganxadi and Ganaxtedi clans who derived their names from this area. According to Goldschmidt and Haas (1946) who conducted interviews with Native people in an effort to determine traditional land-use patterns, it was determined that the Emerald Bay area was within the territory of the Kiks'adi people of the Stikine area and was likely utilized for seasonal subsistence activities.

Archaeological Surveys

During the pre-field work literature search and analysis, a single notation indicating cultural use of Emerald Bay was located in T.T. Waterman's 1926 report "Tlingit Geographical Names for Extreme Southeast Alaska". Waterman listed in his field notes a portage trail from Spacious Bay on the east coast of Cleveland Peninsula to Emerald Bay. This report also suggests that a portage route was used from Yes Bay to Santa Anna Inlet. Kiks'adi oral traditions may indicate that at least one early migration of the clan utilized a route crossing between Spacious Bay and Vixen Inlet (Feller, 1997).

Field investigations were concentrated along the coast line and estuaries. An aerial reconnaissance of the interior areas between Spacious Bay and Emerald Bay indicates that there are a number of game trails which intersect and meander across the breadth of the peninsula (no project activities are proposed for the interior wetland areas). The topography from Emerald Bay to Spacious Bay gains up to three hundred feet of elevation and is vegetated with dense berry bushes and a predominate overstory of hemlock along the drainages and higher elevations. The elevation and open muskeg environments are more consistent from Spacious Bay along the Wasta Lake and Creek drainage system to the vicinity of Vixen Point and Inlet. The assumption from these inspections is that a portage trail would be ephemeral and virtually indistinguishable from the many game trails currently present. A portage trail could have been followed to the Vixen Inlet vicinity as well as to Emerald Bay.

Archaeological surveys in Spacious Bay during 1996 and the Emerald Bay survey in 1998 failed to locate any camps or a specific trail that could be associated with a portage route. Despite intensive survey of the estuaries and the coastal areas with good shellfish concentrations, beaches to land boats, fresh water, and well-drained localities, no indications of long-term use were identified. One historic site, CRG-480, was identified and documented by the Emerald Bay survey. Additionally, the survey did identify 21 culturally-modified trees. The majority of these modifications were alcoves cut into the trees indicating fire-making activities associated with either recreational or subsistence activities. Four rectangular bark-stripped cedars are modifications that can be attributed to Native bark stripping activities. Thousands of hand-logged stumps were found throughout the area along the coast and estuary and for some distance inland from the coast, indicating extensive hand logging activities

during the 1900s. It is possible that these logging activities may have obliterated any cultural sites that existed in the locality.

Effects Of Alternatives

As currently planned, all harvest and most of the proposed road construction activities in the proposed Alternatives for the Emerald Bay Project Area will fall in low-sensitivity areas for cultural resources (high elevations and steep slopes), as defined in the 1995 agreement (#95MOU-10-029). The archaeological analysis from literature search and the subsequent field survey in areas having the highest probability for locating cultural resource sites has located no significant historic or prehistoric properties. It is expected that there will be no direct or indirect effects on any significant cultural resource sites from the activities planned here. Post-construction monitoring of a sample of roads and units will be implemented to further evaluate the sensitivity model.

Marine Environment, Log Transfer Sites and Related Facilities

Affected Environment

Marine Environment

Southeast Alaska's coastline consists of approximately 30,000 miles of tidal shoreline; roughly 60 percent of the total Alaskan coast. Within this region, a great diversity of habitats comprise Southeast Alaska's complex estuary and tidal environments.

The intertidal and subtidal marine environments are subject to effects from log transfer and storage facilities; these are the points of concentrated activity associated with marine transportation of logs. Deep bays or coastlines along straits or channels are preferred sites for log transfer facilities (LTFs), log storage areas, camp settlements, and anchorages. These areas are preferred because the deeper water and stronger currents flush out bark and debris that may enter the water, and therefore have less impact on marine life. Other marine areas are not addressed here because the timber harvest activities of this project are not expected to affect these areas.

The shallow marine waters and associated mud flats and estuaries found in the protected coves and bays provide habitat for some important species such as Dungeness crab and juvenile salmon. They are part of a complex and dynamic ecosystem that also includes shrimp, flatfish, marine worms, echinoderms, sponges, sea anemones, shellfish, plankton, marine algae, and other organisms.

Log Transfer Facilities (LTFs)

The transportation of harvested timber on the Project Area requires that the logs must be trucked or flown to the ocean, transferred to the water (or barges) at an LTF, and towed to a sort yard for sorting. They are then moved to processing sites such as the sawmills at Ketchikan or Wrangell.

There is one potential LTF within the Project Area.

Table Marine-1
Proposed LTFs Associated with the Project Area

Location	Number	Latitude	Longitude
Emerald Bay (Emerald #8)	1	55 15 02 N	132 13 46 W

Source: Oien 1998

Log Transfer Methods

Four log transfer methods were considered in this analysis: (1) A-Frame type entry device with rafting facilities, (2) low angle ramp, float-off type facility, (3) land-to-barge type facility, and (4) helicopter-to-water or barge facility.

A-frame

A modified version of this method uses a stationary A-frame boom with sloping guide rails placed on the bulkhead to guide the logs to deep water at lower tidal levels. Both A-frame systems allow controlled entry of logs into the water. A-frame systems require a minimum of 5 feet of water at low tide.

Low angle ramp

The low-angle ramp method consists of a shot-rock ramp sloped at 10 to 20 percent grade with wood or steel rails on the ramp surface. Log bundles are walked down the ramp into the water by use of a rubber-tired log loader. Low-angle ramps generally require a minimum of 5 feet of water at low tide.

Land-to-Barge

The land-to-barge transfer system requires a deep water bulkhead for the barge mooring facility. A minimum of 25 feet of water at low tide is required for barge operations. Logs are loaded directly onto the barge by use of a loader. Barges can also load logs floating in the water with on-board cranes.

Helicopter-to-water or barge

The helicopter transfer of logs to water transportation modes consists of moving logs from the harvest area directly to the water. The logs are placed in a containment area (bag boom), then moved by boom boat to the raft or sort yard. A modification of this system is to fly logs directly onto a barge.

Each LTF requires a log transfer area, a small airplane and boat dock, an equipment off-loading ramp, a log sort yard on the uplands and a log raft storage area. These facilities are generally located within close proximity of the LTF to reduce costs and retain impacts within a localized area.

Sites Considered in Detail

The area is limited in the number of sites available for consideration due to the exposure to weather and outside waters. A total of two LTF sites were considered for this project. One site was eliminated from further consideration for terrain or environmental reasons. The preferred site which meets the Alaska Timber Task Force Siting Guidelines for LTFs would be developed as a land-to-barge site. Due to the single entry and lower volume of timber accessible to this LTF, the barge facility will be constructed to have a lower than normal impact on the marine environment, but this will also limit its use at lower tides and will require the use of smaller barges for the loading of logs.

Emerald Bay #8 is a proposed site that would access timber from the Emerald Creek drainage and the surrounding areas.

Additional information and analysis can be found in the Evaluation of Log Transfer Facilities. LTFs were selected using the Alaska Timber Task Force Siting Guidelines and Section 404(b)(1) of the Clean Water Act to mitigate the effects of LTFs on other resources and ecosystems. See LTF analysis in Using 404(b)(1) Guidelines of the Clean Water Act, LTF Reconnaissance Report found in planning record.

Logging Camps

The area surrounding the Emerald Bay Project contains protected bays and coves, suitable for float camps.

Float Camps

The number and locations of float camp sites will depend upon the number of logging and road construction contractors engaged in implementing the project. Additionally, camp configuration and type (such as barge or log floats) will influence the location. The operator shall obtain required State and Federal permits for camps.

Land Camps

The contractor/operator will be responsible for obtaining appropriate permits for camps in areas other than those already permitted. Solid waste disposal will not be allowed on National Forest land. There are adequate upland areas for land camps at each LTF site.

Effects of the Alternatives

Log Transfer Facilities

The use of LTFs required to harvest the timber scheduled in the action alternatives varies. Table Marine-2 displays the LTFs required for each alternative.

Table Marine-2
LTFs Required for the Alternatives

	Alternative		
	A	B	C
LTFs	0	1	0*

Source: Oien 1998
* Alternative C is all helicopter yarding. No LTFs required. Helicopters will yard directly to barge.

Selection Rationale

Types

Log Transfer Facilities can be either low-angle ramps or bulkhead type (A-frame or land-to-barge type) structures used for transferring logs from trucks to saltwater. The lift-off system may be either a single or double A-frame. Bulkhead construction ranges in direct impact to the intertidal area from 0.1 acres to 0.25 acres.

Table Marine-3 displays the construction costs associated with each LTF.

Another form of log transfer from land to water is aerial transport of logs from the harvest area directly to water or a barge. This method eliminates the need for truck haul and road development. Aerial transport of logs direct from land to water can have an effect on the marine habitat due to the loss of bark and other debris from the logs deposited directly to the water. For this reason, and because this area has traditionally had heavy use for commercial fisheries, all aerial yarding operations will require land-to-barge operations where logs will not enter the water. All accumulated debris on the barge will be flown back to the harvest units. Alternative C analyzes the use of helicopter yarding.

Table Marine-3
Construction Costs Associated with Proposed LTF

LTF	Number	Transfer Method	Transfer Equipment Cost*	Site Development Cost
Emerald Bay	1	Barge Bulkhead	0	$80,000

Source: Oien 1998
* Transfer equipment costs are not included in transportation system development costs.

Marine Benthic Habitat

During the transfer of logs from land to water, bark is sloughed off and may be deposited on the ocean bottom; bark also is continually sloughed off, while the logs are in rafts, by agitation from wind and waves. If the bark accumulates on the bottom, it can diminish habitat for bottom-dwelling crustaceans and mollusks, as well as hamper underwater vegetation used as food and rearing sites for fish and other organisms. In 1985, it was determined that discharge of bark into the water at an LTF was a discharge requiring a National Pollution Discharge Elimination System (NPDES) permit. The LTF has been designed to maximize the flushing of suspended bark away from the LTF area to the open sea before it can accumulate on the bottom.

Marine benthic habitat impacts are expected to be as follows:

Structural Embankment:	estimated 0.23 acres affected per site
Site Bark Deposition:	1.0 acre zone of deposition per site
Raft Storage Bark Deposition:	unknown

The marine benthic environment impacts are displayed in Table Marine-4.

Table Marine-4
Estimated Marine Benthic Impacts (Acres) by Alternative

	Alternative		
	A	B	C
Affected by Structural	0	0.23	0
Affected by Bark	0	0	0

Source: Oien 1998

Structural Embankment

All LTF types occupy approximately the same amount of bottom area but in different configurations. For instance, the low-angle ramp system with a 10 percent grade extends approximately 250 feet out into the water on a moderately sloped beach. This system is thus long and narrow. The barge and A-frame systems use more shoreline and do not protrude out into the water as much as the low-angle ramp system.

Site Bark Deposition

Two publications describe some of the general effects of LTFs and log storage on the marine benthic habitat. Sedell and Duval (1985) summarize the information available on the effects log transport and storage have on marine resources and fisheries. Faris and Vaughn (1985)

examined log transportation and log storage in Southeast Alaska.

Shultz and Berg (1976) examined 32 existing LTF sites and found that 19 had bark accumulation, 8 had no bark accumulation, and 5 had traces of bark. The extent of bark accumulation ranged from 0 to 9 acres for 31 of the 32 sites. The 32nd site had an accumulation of 182 acres that could not solely be attributed to log transfer activities. Faris and Vaughn (1985) reexamined the original data from Shultz and Berg (1976) and found that the average accumulation size was 1.96 acres for all sites excluding the 182-acre site. They speculate that bark and debris accumulation may be decreasing over time due to currents. No estimate was made on the length of time before bark accumulation was completely eliminated.

Faris and Vaughn (1985) also examined the extent of total damage to the marine benthic habitat in Southeast Alaska. Their results indicate that from the 90 currently permitted sites, a total of 176 acres would be affected (using the 1.96 acre average). This is 0.02 percent of the total estuarine area that is less than 60 feet deep in all of Southeast Alaska. Moreover, when they examined all of the potential area of bark and debris accumulation from all permitted and proposed sites in Southeast Alaska, including all sites considered in the KPC Long-term Sale 1989-1994 EIS, they found that a total of 317 acres would be affected. This is 0.09 percent of the total estuarine area that is less than 60 feet deep. This result corresponds with the conclusions of Sedell and Duval (1985) that the evidence of damage on important marine populations (bivalves, crabs and salmonids) was inconclusive because of the small area of impact. This evidence resulted in development of the current siting guidelines (e.g., avoiding crab habitat, shallow areas at the heads of bay, etc.) and suggests impacts would be minimal.

The major effect of bark and debris accumulation is on little-neck clams and bay mussels which are eliminated when as little as 4 to 5 inches (10-13 cm) of bark accumulates (O'Clair and Freese 1987). Furthermore, Conlan and Ellis (1979) reported mollusks and several polychaetes were eliminated by bark debris thicker than 2.5 cm, and that effects of bark may last several decades. From this evidence, it can be assumed that other plants and animals which live in and on the bottom would probably be at similar risk.

Concentrations of chemical leachates from bark have been shown to be toxic to salmon fry, crabs, and clams. However, these toxic substances can settle in saltwater and therefore do not appear to be a major problem in open water where good circulation exists (Sedell and Duval 1985).

Certain dissolved substances (hydrogen sulfide and ammonia) recently have been shown to occur in open spaces between pieces of bark accumulated on the bottom (O'Clair and Freese 1988). O'Clair and Freese also note that it is not clear whether other toxic substances not measured in the study occur within bark accumulations. These substances do not enter the water above the bark. However, if Dungeness crabs burrow into the bark deposit, it has been demonstrated that their reproductive ability, eating habits, and overall survival can be affected. It should be noted that this type of effect has been demonstrated in only one bark accumulation field (Rowan Bay LTF, Kuiu Island, Southeast Alaska) and that, in general, Dungeness crabs were not found in bark accumulations at a number of other LTF locations. It is not known whether these effects would occur for other burrowing crab species. Since king crabs do not burrow, it is not clear whether this species is affected by bark and debris accumulation at LTF sites.

The Alaska Timber Task Force Siting Guidelines for LTFs attempts to mitigate the potential effects of bark dispersal and toxicity by: (1) locating LTFs in areas having the least productive intertidal and subtidal zones, (2) avoiding sensitive habitats, (3) avoiding shallow water,

and (4) providing that LTFs should be located along or adjacent to straits, channels, or deep bays where currents are strong enough to disperse sunken or floating wood debris. Currently, all active LTFs receive a yearly underwater diving and sampling transect as required by the Environmental Protection Agency.

Raft Storage Bark Deposition

The other potential effects associated with LTFs are from log rafts and log storage in saltwater. The area under a log raft may be affected by bark accumulations with effects similar to but not as concentrated as those discussed for LTFs. In addition, if the raft is stored in a bay or cove for a long period of time, marine algae may be affected by shading. Occasionally, rafts stored in shallow depths may ground on the bottom. This would cause mechanical disruption or compaction of inter- and subtidal bottom habitats. This would be a short duration effect because recolonization would begin shortly after the raft refloated, unless the site were repeatedly used and log rafts frequently grounded. Proposed log storage areas have a minimum of 40 feet of water depth at low tide. These areas are deep enough that logs are not expected to ground.

Barge LTFs

Barge LTFs probably have less effect on the marine environment than rafting LTFs, since logs are not rafted directly in the water, however, conclusive studies are not available for comparison. The rock bulkhead associated with the facility would be longer and slightly wider at the seaward end. The additional length and width would impact less intertidal area than a rafting LTF bulkhead. The longer length and wider seaward end in deeper water would require dredging and filling in the subtidal area. Barge LTFs require deeper water for the barge, thus extending the bulkhead further out into deeper water, increasing the effects of the LTF on aquatic habitat by leaving a larger footprint on the marine habitat. The effects vary with each site. Bark and debris would accumulate only in a small area around the extreme seaward end of the facility.

Helicopter to Barge LTF

Helicopter to a barge LTF probably has less effect on the marine environment. Helicopter to barge LTFs minimize bark deposition and eliminate embankment in the marine environment.

Fisheries

The effects of LTFs on fisheries resources have not been quantified. It is unlikely that any effects on returning anadromous fish would occur unless a LTF and raft storage area caused blockage of a stream entrance. Juvenile pink and chum salmon that spend several months, immediately after out-migration, in protected bays and coves would be more likely to be affected by log transfer activities. These small fish are highly mobile as they feed on marine invertebrates. Some of their preferred food items live on the bottom surface. Bark accumulation and the area under the embankment of a standard bulkhead eliminates a small portion of the habitat of those food items but is unlikely to cause measurable adverse consequences.

It has been hypothesized that the breakwater usually associated with a LTF structure, regardless of whether a raft or barge, can cause greater mortality of pink and chum juveniles because they are forced to move into deeper water where more predators consume them. It is not known whether this is a major source of mortality in addition to the naturally low survival rate attributed to early marine life stage of juvenile pink and chum salmon. Because barge LTFs require longer breakwaters, the probability of this effect may be increased.

There is no formal documentation that LTF structures or activities associated with their use

conflict with commercial fishing near the facility. If a facility were located in a small bay or cove, it is possible that there could be some difficulty maneuvering around log rafts or moored barges to get to favored fishing sites. No adverse consequences on commercial fishing, subsistence uses or marine resources are anticipated as the result of LTF location.

Camps associated with a LTF site can cause additional use of fisheries and marine sources. There is no data currently available on the amount of additional use occurring at various camp locations in the study area. The competition for resources at or near logging camp locations would probably increase. There is currently little or no information to indicate that resource allocation problems have occurred as the result of a logging camp. The Board of Fisheries and Game for the Alaska Department of Fish and Game (ADF&G) can control the amount of harvest by setting bag limits, shortening season lengths, or by instituting a complete closure of a fishery. If resource problems arise because of increased resource pressure due to a logging camp, the Forest Service would aid the ADF&G in attempting to resolve the problem. However, it is unlikely that utilization would progress far enough to cause adverse consequences on the fisheries or marine resources.

Wildlife

From a wildlife perspective, there are two types of effects associated with a LTF and camp. First, there is the potential loss of habitat due to clearing for the camp, sort yard, and associated facilities. The amount of habitat lost is relatively minor. Whenever possible, camps and sort yard facilities are located away from the highest quality habitat. The differences between a slide facility and barge facility are inconsequential. The objectives are to avoid eagle nest sites and estuarine habitat. The second type of effect is disturbance as a result of increased human activity associated with the camp. The overall effects of disturbance of wildlife use patterns are generally minor. Most wildlife species adapt to increased human activity but will be affected by increased hunting, and increased bear-human encounters.

For additional information on the effects of the proposed alternatives on existing users, see the ANILCA, Section 810, Subsistence Evaluation and Finding in the Subsistence section of this chapter.

Visual Resources

The large size, linear bold shape, and saltwater location of LTFs generally dominate the landscape when viewed within the foreground distance (less than ¼ mile). Their relatively low profile, however, helps mitigate the negative visual impacts when viewed from the middle ground (¼ mile to 5 miles). The visual contrasts of openings or clearings for sort yards and land camps, located on fairly level or gently sloping sites, help absorb much of their visual impact when viewed from saltwater viewpoints.

There are new sort yard areas considered in the alternatives for this Project Area. It is expected that most camps will be floating. Accordingly, upland development will consist of structures such as maintenance shops and fuel storage tanks. These facilities will have minimal permanent visual resource impact.

Long-term Productivity

The short-term effects of developing LTFs in the intertidal area can be compared to the value of long-term accessibility for timber management in the area. Without a way of transferring logs into saltwater, the long-term opportunity to manage the uplands for commercial timber is lost. If LTFs were not approved by permitting agencies, the volume accessible by those facilities would not be available to meet Forest Plan direction.

It is assumed that other resources would have similar management opportunities with or without access to the uplands from saltwater (by an LTF). Table Marine-5 compares the

number of acres potentially affected by each LTF to the number of acres of suitable timber harvest for each location.

Short-term use of 0.23 acres of estuarine habitat, all of which occurs in large estuaries, would provide access to 957 acres of land suitable for timber production. This roughly equates to 10-15 million board feet to be available to help meet the goals of the Tongass timber sale program.

Table Marine-5
Comparison of Short-term Impact on the Estuarine System to Long-term Harvest (Year 2000 to 2004)

LTF Name	VCU Served by LTF	Estimated Acres of Impact on Estuarine System	Acres of Potential Harvest
Emerald Bay	721	0.23	746

Source: Oien 1998

Recreation

The following discussion and analysis are based on the Scenic and Recreation Resources Report for the Emerald Bay Project (1998). The Tongass recreation and roadless area resources are discussed in considerable detail in the Forest Plan EIS, Chapter 3. Applicable direction from the Forest Plan is contained in Chapter 3 (Timber Production and Old-growth Habitat land use designations) and Chapter 4. See also the Scenery section of this chapter.

Affected Environment

All recreation occurring in the Project Area is land based and only accessible by boat. The only logical saltwater-based access point is at the Emerald Creek estuary. At low tide there is a small sloping gravel beach to the left of the estuary. It appears this cove may offer suitable anchorage except in strong northerlies. There are no developed recreation sites at Emerald Bay or nearby. Although there are no records of recreation use within the Project Area, recreational use may occur along the shorelines of Emerald Bay and Emerald Creek in the form of fishing, swimming, and boating. Upland recreation may be hunting and hiking in the alpine areas south and west of Emerald Bay.

There have been reports of a historically significant cultural trail connecting Emerald Bay estuary to the Spacious Bay shoreline near the Wasta Creek outlet, a distance of nearly 7 miles. See the Cultural Resources Report and Cultural Resources section of this chapter.

Recreation Opportunity Spectrum

Inventory of the recreation resource is accomplished by the Recreation Opportunity Spectrum (ROS). Six recreation experience settings define varying scales of human interaction levels and visitors expectations, from Primitive to Urban. This range reflects levels of current and past human management activities. All the acreage in the Project Area is entirely classified as Primitive - a setting that has never been altered by any resource utilization.

Recreation Places

Recreation places are geographical areas of small to moderate size which have one to several features that are particularly attractive to people engaging in recreation activities and receive recurring use. These features may be beaches, streamside or roadside areas, trail corridors, hunting areas, camping and picnic areas, anchorages, or other features. The Project Area currently has no identified recreation places. Two potential recreation places are a location suitable for a trail, trailhead and shelter near the estuary, and an anchorage and/or mooring buoy in the bay.

Potential Emerald Creek - Spacious Bay Trail, Trailhead and Shelter

The potential trail and the trailhead are presently in an unmodified condition and are not directly affected by past timber harvesting. Views along some portions of the potential trail are modified. The bank of Emerald Creek opposite the potential trail was harvested in the past, but regrowth now covers most evidence of past harvest.

Potential Emerald Bay Recreation Place - Anchorage/Mooring Buoy

Short-term recreation effects will occur in the form of sounds of logging activities. Some minor visual disturbances may be seen from the beginning of the potential trail. There will be no site-specific, direct effects on the potential trail corridor under any alternative.

Inventoried Roadless Area

The entire 7,845-acre Project Area is within the inventoried 190,230-acre Cleveland Roadless Area #528. This roadless area is characterized by rugged terrain except for the uplands where the topography is flat wetlands and muskeg. The major scenic features are the diverse alpine terrain and small lakes. Although the southern portions of this roadless area receive significant local resident use for subsistence and recreation activities, it is not known just how much such activity goes on in the Emerald Bay Project Area. The area may have occasional minor use by local residents for recreation and subsistence. The Project's roadless area has been unaltered by human activity, its natural integrity is intact, and opportunities for solitude are excellent.

Environmental Consequences

Effects on Recreation Places

Potential Emerald Creek - Spacious Bay Trail, Trailhead and Shelter
Short-term recreation effects will occur in the form of sounds of logging activities. Some minor visual disturbances may be seen from the beginning of the potential trail. There will be no site-specific, direct effects on the potential trail corridor under any alternative.

Potential Emerald Bay Recreation Site - Anchorage/Mooring Buoy
Short-term recreation effects will occur in the form of sounds of logging activities. Some minor visual disturbances may be seen from the potential mooring buoy. There will be no site-specific, direct effects on the anchorage under any alternative.

Inventoried Roadless Area

Only the roaded action alternative, Alternative B, will affect the Project's roadless characteristics. The status of "inventoried roadless area" is usually limited to unroaded areas (other than entire islands) at least 5,000 acres in size. Inventoried roadless areas are those meeting minimum requirements for possible future consideration as Wilderness.

Of the two action alternatives, only Alternative B is likely to change the roadless area status of the Project Area. Alternative A, the no-action alternative, proposes no human management activities in the Project Area. Alternative B proposes several clearcut harvest units along proposed roads on the east side of the area; these would not cumulatively result in the roadless character dropping below 5,000 acres. Alternative B proposes 492 clearcut acres and a road of about 6.2 miles entering the area to the north of Emerald Creek; these alterations would change the roadless character only within the Emerald Creek drainage.

Mitigation

There are no suggested recreation resource mitigations for this Project Area.

Scenery

The following discussions and analysis are based on and summarized from the Scenic and Recreation Resources Report for the Emerald Bay Project (1999). The scenic resources of the Tongass are also discussed in the Forest Plan EIS, Chapter 3. Applicable direction may be found in the modified Forest Plan, Chapter 3 (Timber Production and Old-growth Habitat land use designations), Chapter 4, and Appendix F.

Affected Environment

Visual Character of the Project Area

The scenery of the Emerald Bay Project Area is viewed from Ernest Sound, a major waterway utilized by the Alaska State Ferry System, barge and ship traffic, small cruise ships, and numerous pleasure craft. Ernest Sound is oriented in a southwest to northeast direction with eastern views of the Project Area. As viewed from saltwater, the Project Area is typified by mountains rising steeply from the sea to elevations of 2,000 feet forming a bluff-like appearance. Visible portions of the Project Area are inland of this "bluff" area along a second mountain ridgetop and slope. The visible portions of the Project Area are framed and accentuated by a noticeable gap in the aforementioned "bluff" due to a narrow valley formed by Emerald Creek and its estuary meeting at saltwater. The Project Area ridgetop has visible alpine and open muskeg areas with little vegetation and steep, densely forested hillsides on north-facing slopes.

For planning and analysis, the scenic resource is described by viewsheds. A viewshed is a land area visible from a specific human use area or travel route. The Forest Plan identifies specific "priority" use areas and travel routes from which the scenic resource is to be specifically managed. The Emerald Bay Project Area has no priority use areas and only one priority travel route - the Alaska Marine Highway Ferry Route along Ernest Sound.

The visual condition of the Project Area appears natural and undisturbed although there are some indications of previous harvest when on the beach. Evidence handlogging and A-frame beach logging which occurred in the early 1900s, mostly along the creek bottom.

The Forest Plan provides specific visual management direction for the National Forest lands within the Project Area. The Timber Production and Old-growth Habitat land use designations include visual resource standards and guidelines that apply to the timber harvest and related activities they may allow. Generally, and exclusive of the Old-growth Habitat designation, Timber Production encompasses areas not seen from the Alaska Marine Highway Ferry route, and applies to the ferry route and Emerald Bay viewshed. The Timber Production designation allows foreground areas (up to less than 1/2-mile from viewer) to be moderately altered (15-25 percent visible disturbance), and middleground and background areas to be heavily altered (25-50+ percent visible disturbance). However, these heavily altered areas must appear as natural openings when viewed from 4 miles or more distant (background distance zone).

Visual Condition of the Viewsheds

The Ernest Sound viewshed identified above is in a natural-appearing visual condition. This is a result of past beach and stream bottom harvest being fully regenerated to a near-mature height, color, and forested texture.

Non-Priority Travel Route Viewshed

Ketchikan-Wrangell Aerial Flight Path

Scenic quality determinations from aircraft are not emphasized in the Forest Plan. However, this Project Area is on a major small aircraft route between Ketchikan and Wrangell. Aerial views of the Project Area from small aircraft are usually viewed from a 1,500-foot altitude. Emerald Bay is the northwestern terminus of a noticeable terrain feature - a mountainous escarpment connecting Spacious Bay on West Behm Canal to Emerald Bay. This visible and dominating physical feature marks a change in landscape types, from open, low-elevation muskegs interspersed with a few hills to a large, massive block of mountains with large areas of alpine meadows at the 1,500 to 2,500 foot elevation. Both commercial and private aircraft follow this natural terrain feature due mostly to safety. The likelihood of inclement weather along this aerial route forces many pilots to fly near minimum altitudes, thus forcing them to follow low-lying land features.

Environmental Consequences

Effects by Viewshed

The effects discussion centers on the viewsheds just described. All other areas are considered unseen from saltwater. See descriptions of alternatives in Chapter 2 regarding unit prescriptions and percent crown cover retained.

Priority Travel Route and Saltwater Use Area Viewshed

Alaska Marine Highway Ferry Route - Ernest Sound

Only two of the Emerald Bay units may be seen from the decks of a boat at some point along the route and under Alternative B would appear as natural, muskeg openings from a background view of 4 miles or greater. Little noticeable change will result from the selective harvest of units visible from the boat route in Alternative C. These units, as designed, would exceed the Forest Plan visual objective of maximum modification as viewed in the middleground from Ernest Sound visual priority route.

Non-Priority Travel Route Viewshed

Ketchikan-Wrangell Aerial Flight Path

All of the Emerald Bay harvest units will be visible from the air. Depending on aircraft flight altitudes and direction, these units will be in either a foreground or middleground viewing distance, and noticeable by air travelers. Although the majority of these units would be harvested by alternative harvest methods, some of these units will still exhibit textural differences for many years after harvest activities are completed.

Cumulative Effects

The priority travel route viewshed is within the Timber Production and Old-growth Habitat land use designations of the Forest Plan. Over time, harvested areas within this designation may change from a slightly obvious altered character of even-textured old-growth forest with a few natural muskeg and alpine-like openings, to a more visually diverse forest. Harvest areas and edges visible to the Ernest Sound viewshed will be designed to reflect nearby landform shapes, with the visual impact of these openings receding relatively quickly. Ultimately, these openings will resemble natural occurrences from all points of view.

For those roaded portions in Alternative B, the future will show more evidence of a working, industrial forest. Changes will be more obvious to forest visitors in the form of harvest units and supporting infrastructure.

Mitigation

Current and future units in Alternative C will primarily be harvested with partial harvest prescriptions that will mitigate the visual effects of timber harvest.

3 Environment and Effects

Silviculture and Timber Management

The following discussions and analysis are based on a variety of sources including existing data, and data gathered during field visits in 1998 and 1999. Additional background on forest land classification, silvicultural and logging systems, and other related topics may be found in the Forest Plan EIS, Chapter 3: "Timber" and Appendix G. Applicable direction is contained in the Forest Plan, Chapter 2, Chapter 3 (Timber Production Land Use Designation), Chapter 4 (Forest-wide Standards and Guidelines), and Appendix A.

Affected Environment

Forest Land Classification

The natural vegetation of the Emerald Bay Project Area is a mosaic of coniferous forest interspersed with alpine tundra, muskeg (bog), shrubland, estuarine, and beach fringe plant communities. The area contains seven forested plant series, all of which are commonly found throughout Southern Southeast Alaska: Sitka spruce, western hemlock, and mountain hemlock series; western hemlock-yellowcedar and western hemlock-western redcedar series; and mixed conifer and shore pine series. Together these are loosely termed "old-growth forest." The Biodiversity and Old Growth section of this chapter discusses aspects of old-growth forest not related to forest products. Various nonforested plant communities also occur in the Project Area, in estuaries, riparian areas, muskegs, alpine meadows, and alpine lichen rock outcrops.

National Forest System lands are defined by vegetative cover, soil type, and administratively or congressionally designated land use. This classification scheme is intended to show the amount of land that is covered by forest vegetation with further divisions to show the amount of land capable of, or available for, timber production. Appendix A of the Forest Plan provides a detailed discussion of timber resource land suitability. To be considered both suitable and available for harvest, lands must be determined tentatively suitable for timber management, and must be within a land use designation that allows timber harvest. For the Project Area, this is the Timber Production Land Use Designation. Within this designation, Forest Plan Standards and Guidelines also apply, making additional areas - the beach and estuary fringe, riparian management areas, and wildlife nest or den buffers - unsuitable or unavailable for timber harvest.

To be considered suitable for timber management, forested lands must be capable of producing 20 cubic feet of tree growth annually, and/or must contain at least 8,000 board feet of net timber volume per acre. These are termed "commercial forest lands." (In the Biodiversity and Old Growth, and Wildlife sections of this chapter, old-growth forest is divided into productive and nonproductive components.

Forest lands within the Project Area total about 7,845 acres. Of the 7,845 acres of forest land, 6,888 are classified as unsuitable for timber management, either through land use designation (as Old-growth Habitat), Standards and Guidelines (riparian areas and the beach fringe), or soils or slope criteria. This leaves 957 acres currently tentatively suitable and available for timber harvest.

Forest Plan Desired Future Condition

Stands of trees that are healthy and in a balanced mix of age classes, from very young to harvestable age, are a key part of the desired future condition for lands within the Timber Production Land Use Designation.

A small portion (approximately 14 acres) of the Old-growth Habitat Land Use Designation near the estuary was harvested approximately 60 years ago. Historically single-tree beach harvest has also taken place in the Project Area.

Silvicultural Systems

The term "silvicultural system" refers to a planned process whereby a stand is harvested, reestablished and tended. The system name is based on the number of age classes present after the initial harvest, such as even-aged, two-aged and uneven-aged systems.

Even-aged systems produce stands that consist of trees of the same or nearly the same age. A stand is considered even-aged if the range in tree ages normally does not exceed 20 percent of the age at which the stand is to be harvested (the "rotation age"). Seed tree cutting, shelterwood cutting, and clearcutting will produce even-aged stands.

Two-aged stands result from treatments which leave behind a substantial portion of the original stand structure in the form of large trees distributed or clumped throughout the stand area. The remnant trees left on the site represent one "age class" and the newly established trees represent another age class.

Uneven-aged systems create stands that include three or more distinctly different age classes. Uneven-aged conditions are created through management by using individual tree or group selection methods.

Even-aged and two-aged systems more closely mimic the natural conditions of the large scale disturbance ecologies (for instance, areas subject to windthrow) found throughout Southeast Alaska. Uneven-aged systems more closely mimic the gap-dominated old-growth ecosystems (where large-scale disturbance is not a major factor) found throughout Southeast Alaska.

The selection of the appropriate silvicultural system is dependent upon the feasibility of achieving sound silvicultural objectives. These can include objectives for species composition, stand density, growth rate, insect and disease control, and overstory condition and development. The Forest Plan and public issues are used to refine site-specific objectives. It is possible that more than one silvicultural system may be prescribed for the same site, depending upon the alternative in question.

It is important to distinguish scale when visualizing harvest treatments for individual units or stands. For instance, while the ideal condition may be to apply a treatment uniformly over an entire harvest unit, this is often not possible due to terrain, logging systems, or vegetative conditions.

For a detailed discussion of silvicultural systems and methods, see the Forest Plan EIS, Appendix G. Factors influencing and criteria for selection of appropriate harvest methods and silvicultural systems are also presented in the National Forest Management Act implementing regulations (36 CFR 219.27) and the Alaska Regional Guide.

Logging Systems

Yarding is the process of conveying logs from the stump to the landing. This can be done using ground-based equipment, cable logging systems, or helicopters. The method used depends upon many factors including access, topography, slope, and resource protection needs (log suspension requirements).

Ground Based Yarding

Moist, soft soil conditions in conjunction with steep slopes found in the Project Area prove difficult for ground-based equipment operation. Except for a limited amount of shovel logging with track-mounted log loaders, there is little opportunity for this type of equipment. Logging systems planning classified units as either cable, shovel, or helicopter yarded, however some portions of cable units, especially along road rights-of-way, may be suitable for shovel yarding. Shovel settings are primarily confined to Unit 1 in Alternative B.

Cable Yarding

Cable yarding systems are the most common logging systems used throughout the Ketchikan Area. Cable systems are best suited for the steep slopes and wet soils of these areas, and most cable systems partially or fully suspend logs over the ground, minimizing soil disturbance. Currently, when partial suspension is required, running skyline has replaced highlead as the favored cable system and is more economical than other cable systems. Other cable systems are prescribed where running skyline does not meet yarding requirements, such as when resource conditions require increased log suspension, or yarding distances exceed running skyline capabilities.

Helicopter Yarding

Helicopter yarding is proposed in Alternatives B and C. Helicopter yarding has been successfully used in all administrative areas of the Tongass in recent years. With this system, logs are lifted off the ground (fully suspended) and flown to a specially prepared landing or barge. This yarding system causes the least amount of ground disturbance of all the yarding systems, but usually has the highest yarding cost. The economic feasibility of helicopter yarding is more closely affected by timber market values than is cable yarding. Factors that affect flight time and economic feasibility include elevation differences between stump and landing, logs/volume per acre, species mix and subsequent value, and payload capabilities of the aircraft.

Environmental Consequences

Goals and objectives for various land use designations and the application of appropriate standards and guidelines found in the Forest Plan will result in the use of a wide range of silvicultural systems from traditional clearcutting to uneven-aged management. Alternative B is a mixture of traditional clearcutting and partial cutting. Alternative C is entirely uneven-aged management with the majority being individual tree selection, with 26 acres of group selections. Spacial distribution of retained trees will vary between harvest units and alternatives depending on resource objectives, site conditions and logging systems. Proposed harvest units range from 6 acres to 273 acres in size. No created openings exceed 100 acres.

Silviculture: Direct, Indirect and Cumulative Effects

Regeneration

All of the areas proposed for timber harvest are expected to be restocked within five years, as required by National Forest Management Act regulations (36 CFR 219.27(c)). Regeneration (stocking) surveys will be conducted on all harvest units after the third full growing season following the completion of logging. Most harvested areas are expected to be naturally stocked and certified after three full growing seasons. A small number of acres may require planting in Alternative B primarily on wetland soil types.

Successional Stages and the Desired Future Condition

After reforestation, managed forests grow through several distinctive successional stages in which different components dominate the stand and forest structure changes over time. In

Alternative B most harvest units proposed under the Emerald Bay Project are expected to be primarily even-aged with some areas of partial cutting after the initial harvest. The stands will have characteristics of both old-growth and managed even-aged forests since a substantial portion of the original overstory will be retained in portions of most units. Alternative C will follow uneven-aged management prescriptions and will follow successional pathways similar to gap-dominated old-growth forests.

The land use designation allowing timber harvest activities within the Project Area is the Timber Production designation. The Forest Plan desired future condition for Timber Production emphasizes a balanced mix of age classes. All harvest alternatives will move the Project Area toward the desired future condition by creating a balanced mix of stand structures and ages.

Alternative C converts the most acres to a managed condition (746 acres), followed by Alternative B which converts 699 acres to a managed condition. Alternative A proposes no timber harvest and thus converts no stands to a managed condition.

Both alternatives convert the majority of the suitable and available lands within the Project Area to a managed condition in this entry. This is primarily for operational and economic reasons due to the remote location of the Project Area and the high costs of mobilization.

Long-term Timber Productivity (Yield)

All stands proposed for harvest are overmature and well beyond the age of maximum average annual growth of the stand. Most are representative of uneven-aged western hemlock stands that commonly take hundreds of years to develop under natural conditions. Harvest increases forest floor temperatures, speeding up organic decomposition and increasing the supply of available nutrients to the trees. The effects of all action alternatives on long-term yield would be the conversion of unmanaged, slow-growing, overmature stands to managed, faster growing, multi-aged or even-aged stands.

The open conditions created by even-aged systems allow Sitka spruce, western redcedar, Alaska yellowcedar and western hemlock to regenerate rapidly. With the use of precommercial thinning, an increase in the spruce and cedar components can be attained in an attempt to restore the original stand structure. The composition of the uneven-aged stands proposed in the Emerald Bay Project is expected to be similar overall to the original composition. However, over the course of several cutting cycles, the mix may vary.

Although log quality in managed even-aged stands could be lower than in existing stands, even on sites that have been precommercially thinned, total yield per acre will be higher in even-aged stands. The use of uneven-aged techniques should help raise the overall log quality in managed stands, however, some yield per acre will be sacrificed.

Post-harvest Silvicultural Treatments

Various post-harvest silvicultural treatments will be prescribed on a site-specific basis to help move the Project Area toward the Forest Plan desired future conditions. Treatments may vary from site to site depending on land use classification, slope, soils, aspect, elevation and resource objectives.

Site-specific unit prescriptions will guide silvicultural treatments for units harvested under this project. Precommercial thinning reduces the competition for sunlight, moisture, and nutrients for what is often referred to as growing space. This additional growing space results in the understory plants and remaining conifers growing at accelerated rates for longer time periods than unthinned, young even-aged stands. Precommercial thinning can also be used to change species composition and windfirmness of the stand. Cedar and spruce will be

favored during the thinning process.

Precommercial thinning is performed approximately 15-25 years after harvest and is dependent upon site, stocking, and other resource needs. Due to steep terrain, accessibility, safety considerations, resource protection needs, and budget constraints, some acres will not be thinned.

Timber Management: Direct, Indirect and Cumulative Effects

Proposed harvest volume is displayed by VCU and alternative in Table Silv-1. Alternative A has no timber harvest. Alternative B would offer the most timber volume for sale, about 14-16 million board feet. It is the only alternative with road and LTF construction. Alternative C would offer 8-12 million board feet. Volume recovered from right-of-way (ROW) clearing is in addition to the proposed timber harvest and is not included in the table. Alternative B would harvest 950,000 board feet ROW volume.

Table Silv-1
Proposed Harvest Volumes by Alternative

	Total MMBF Volume		
VCU	**Alt. A**	**Alt. B**	**Alt. C**
721	0	14–16	8–12
Total Unit Volume	0	14–16	8–12

. Source: USDA Forest Service, Ketchikan Area GIS

Logging System Transportation Analysis (LSTA)

The original LSTA for the Emerald Bay Project Area identified approximately 957 acres of potential harvest units. However, the GIS data base is not refined enough to show small inclusions of unsuitable land within suitable stands. Subsequent field analysis removed over 100 additional acres (including portions of potential units) as being unsuitable or uneconomical for timber harvest. This included areas not capable of producing sufficient volume or not harvestable using existing technology, and unmapped streams requiring riparian buffers. A list of the units not in the current Emerald Bay unit pool and the reasons for not including them is contained in the project planning record.

Effects on Ketchikan Area Timber Supply

As part of the Forest Plan revision process, estimates were made for several factors that have commonly led to actual harvest volumes from timber sales being less than the volumes estimated during project planning (see Forest Plan EIS, Chapter 3: "Timber" and Appendix B). These "modeling implementation reduction factors" (MIRFs) were applied to each Forest Plan alternative, and for each administrative area of the Tongass. Using these MIRFs to estimate actual volumes available over time should result in close correspondence between planned timber harvesting and the volumes actually achieved during harvest implementation. Harvest volume "falldowns" experienced in recent years are not anticipated to occur on the Emerald Bay Project.

Planning for the Emerald Bay Project has already accounted for nearly all acreage deferrals and deletions through interdisciplinary field review. Deferral of harvest to meet Forest Plan Standards and Guidelines occurred early in the process, and additional deferrals due to suitability factors such as very high hazard soils, low site index, and buffers for unmapped streams were accounted for during field review of the proposed units. Few, if any, additional deferrals due to suitability factors are expected.

Economic deferral is dependent on changing economic conditions including log prices, the cost of accessing harvest units (roads), and the efficiency of harvest systems (including yard-

ing and hauling costs). The economics of timber harvesting varies considerably over the short and long term and it's effect on overall timber supply is difficult to quantify accurately. The Forest Plan divides the allowable sale quantity into two non-interchangeable components (NICs) based on economic factors, and requires the two NIC sale volumes to be kept separate for planning and accounting purposes.

Effects Relative to Logging Systems

All yarding is proposed in conformance with National and Regional Standards and Guidelines. Yarding systems were assigned through interdisciplinary analysis to minimize potential effects, and special yarding requirements are specified on the unit cards (see Appendix B). On-site ground reconnaissance and actual field evaluations during the planning and layout process will ensure the yarding system assigned provides the required suspension to meet management objectives. (Effects resulting from logging systems are discussed in the Soils and Water sections.)

Harvest acres by yarding system are shown in Table Silv-2. Shovel yarding is a relatively minor component, taking place in Unit 12 and right-of-way clearing. Alternative B uses running skyline extensively, the most economical cable system commonly in use, for a substantial portion of the harvest (57 percent). Alternative C uses helicopter yarding exclusively.

Table Silv-2
Acreages of Logging Systems by Alternative

Yarding Type	Alt. B	Alt. C
Running Skyline	396	0
Other Cable	103	0
Helicopter	182	746
Shovel	18	0

Opportunities for Small Sales

The harvest units and volumes in all action alternatives would most likely be offered in one sale. There is a potential opportunity to separate volume in Alternative B into two sales by placing the helicopter yarded portion in a separate sale. Table Silv-3 displays the maximum number of sales by alternative, their range in size, and their average size.

Table Silv-3
Estimated Numbers and Sizes of Sales by Alternative

	Alt. B	Alt. C
Maximum Number of Sales	2	1
Smallest Offering (MMBF)	3–5	8–12
Largest Offering (MMBF)	9–11	8–12
Average Sale Size (MMBF)	7	8–12

The Ketchikan–Misty Fiords Ranger District has an annual salvage and small sales program of approximately one million board feet which provides small sale opportunities.

Timber Financial Efficiency Analysis

Current Forest Service Handbook direction (FSH 2409.18; Amendment 90-1 and Supplement 6) requires a financial efficiency analysis to compare benefits and costs of a project. Handbook direction also stipulates that timber harvest projects provide at least 60 percent of normal profit, which must be included when calculating costs. The financial efficiency analysis compares expected gross revenues against estimated costs and arrives at an estimate of net revenues.

Pond Log Values

Pond log values represent the delivered price of logs at the mill minus the cost to manufacture them into usable products. On the Ketchikan Area, the lower volume classes generally have a higher yellow cedar component, which has the highest selling value. On the Project Area, this sometimes results in a high pond log value for the lower volume classes. For this analysis, pond log values reflect lower chip manufacturing costs, rather than higher pulp manufacturing costs, due primarily to the recent closure of pulp manufacturing facilities in Southeast Alaska. The stumpage value does not include bid premiums that may result from competitive bidding for the timber when sold. It should also be noted that chip (or other value-added products) values have not been added into the pond log values. In an actual appraisal, each timber sale would add an appropriate chip value to the value per MBF. Recent appraisals have indicated this value is approximately $100-200/MBF.

Table Silv-4 displays the major timber sale cost components for each action alternative. The "transportation costs" component includes "stump-to-truck" logging costs, such as felling, bucking, yarding, loading, and administration, and related costs such as haul, dump, tow and raft costs. "Construction costs" include all capital investments; for the Emerald Bay Project these include road construction and reconstruction, and bridges.

Dividing total costs by total estimated harvest volume gives an average cost per thousand board feet for each alternative. This cost-per-board-foot measure can be used to compare the overall economic efficiency of the alternatives. This cost is highest in Alternative C, which proposes to use helicopter yarding to eliminate road and LTF construction, use all uneven-aged management prescriptions, and minimize impacts on surrounding Old-growth LUDs. Alternative B spreads its harvest more equally between running skyline, other cable, and helicopter systems.

In table Silv-5, "pond log value" represents the delivered price of logs at the mill less the cost to manufacture them into usable products. Pond log values are closely related to log size, grade, and species.

Table Silv-4
Summary of Timber Harvest Costs by Alternative

Alternative	Harvest Volume (MMBF)	Transportation Costs* (Million $)	Construction Costs** (Million $)	Cost Per MBF ($)
B	14–16	3.3	.87	281
C	8–12	4.7	0	485

* Transportation costs include all costs not associated with capital investments or costs normally connected to road construction, such as: fall, buck, yard, sort, load, haul, dump, raft, and tow.
** Construction costs include costs associated with road construction and reconstruction, such as: pit development, clearing, grubbing, embankment, haul, excavation, and related structures such as bulkheads, bridges, and culverts.

Estimated net timber value (stumpage) is arrived at by subtracting all associated costs from the pond value for all proposed harvest units in each action alternative.

Table Silv-5
Pond Log Values per MBF, by Alternative

	Alternative (Dollar Amount per MBF) B	C
Total Volume (MBF)	14–16	8–12
Pond Log Value Per MBF (Low Market)[1,3]	$189.00	$189.00
Pond Log Value Per MBF (High Market)[1,3]	$521.00	$521.00
Direct Costs Plus Profit and Risk[2]	$315.00	$525.00
Net Stumpage Value Per MBF (Low Market)[4]	($126.00)	($336.00)
Net Stumpage Value Per MBF (High Market)[4]	$206.00	($4.00)

[1] Pond log values: Low market is based on the published figures in the Sea Level EIS; high market is based on 1st quarter 1995 values and average Forest-wide species composition.

[2] Direct Costs = Total logging and total transportation costs

[3] Does not include chip values (approximately $100–$200 / MBF)

[4] Net Stumpage Value = Pond log value – Total direct costs – 60% profit margin.

These projected construction costs, transportation costs, and pond log values are estimates, not actual costs. These estimates are useful for comparing the alternatives. Before the timber is sold, the volume within the units and rights-of-way will be cruised and appraised to determine the actual volume and value of the national forest timber. A Current Market analysis was looked at for comparison also. This showed Alternative B having a slightly reduced value but still positive while Alternative C would need approximately a 20 percent increase in market values to be positive using the assumption for this analysis.

Socioeconomics

Affected Environment

Socioeconomic Setting

The Emerald Bay Project Area is on the north coast of Cleveland Peninsula. It is accessible by boat or small plane from Ketchikan and Wrangell. However, while somewhat accessible to many potential users, survey information shows that the principal users are from the Meyers Chuck community with potential additional use coming from Wrangell, Ketchikan, and Thorne Bay (Communities section of the Forest Plan EIS, pp. 3-529 to 3-680, as is the information below). Community use of the area, such as for recreation, hunting, or subsistence, is discussed in the Recreation, Scenery, and Subsistence sections of this chapter.

There is no comparable community-specific employment information available. The closest is subregional information for all Prince of Wales Island and outer Ketchikan communities combined; within this there is a breakdown for Cleveland Peninsula (Forest Plan EIS, pp. 3-514 to 3-516). In 1995, there were 14 wage or salary jobs in the Cleveland community group. Of these, 14 (100 percent) were lodging or recreation-related jobs. However, for the subregion of Prince of Wales and outer Ketchikan there were 490 (22.4 percent) wood-product related jobs. While this is the highest ratio of logging-related jobs to all jobs in Southeast Alaska, it still represents a 30 percent decline in the past 5 years.

Environmental Consequences

Employment and Income Effects

Effects related to community uses of the area are discussed in other sections of this chapter, as noted above. The Proposed Action would include direct, indirect, and induced impacts to the economy. To estimate the amount of employment and income likely to result from timber harvest alternatives, a simple conversion of board feet to jobs and income is made, using multipliers developed for Southeast Alaska. Table SE-1 below shows the employment and income estimates for the action alternatives. These figures represent employment in logging, construction, marine transport, and sawmills. As would be expected, the higher the harvest, the more jobs and income that result.

Table SE-1
Logging-related Employment and Income by Action Alternative

	Alt. B	Alt. C	No Action
Employment (# jobs)	124	82	0
Income (million $)	5.25	3.5	0

Public Investment Analysis

Public Investment Analysis of the timber harvest alternatives uses pond log values which reflect lower chip manufacturing costs, rather than high pulp manufacturing costs, due primarily to the recent closure of pulp manufacturing facilities in Southeast Alaska. The stumpage value does not include bid premiums that would result from competitive bidding for the timber when sold. It should also be noted that chip (or other value-added products) have not been added into the pond log values. In an actual appraisal, each timber sale would add an appropriate chip value to the value per MBF. Recent appraisals have indicated this value is

approximately $100–$200/MBF.

The average Region 10 Budget Allocation costs and management expenses are subtracted from the net stumpage revenue to determine net value. The costs and management expenses include NEPA planning, sale preparation, harvest administration, and engineering support. These are displayed on a per MBF basis in Table SE-2.

Table SE-2
Public Investment Summary

	Alternative		
Economic Appraisal Inputs	**A**	**B**	**C**
Total Volume (MMBF)	0	14–16	8–12
Roads, New and Repair (Miles)	0	6.2	0
Net Stumpage Value	0	$3,090,000	($40,000)
($)[1]	0	$206 / MBF	($4 / MBF)
($)[4]	0	$126 / MBF	$126 / MBF
R10 Budget Allocation Costs ($)[2]	$410,000	$1,515,000	$1,010,000
Road Maintenance (Additional Cost $)[3]	0	$20,000	$0
Total Costs ($)	$410,000	$1,535,000	$1,010,000
Net Value ($)[2] [4]	($410,000)	$1,555,000 $104 / MBF $24 / MBF	($1,050,000) ($105 / MBF) $25 / MBF

[1] Net stumpage value/MBF based on High Market value presented in Table 5 Silviculture/Timber.

[2] Forest Service costs/mbf based on Region 10 average budget allocation of $41/mbf for NEPA, $23/mbf Sale Prep, $9/mbf Sale Administration, and $28/mbf Engineering Support.

[3] The majority of Road Maintenance Costs have been accounted for in the Net Stumpage Value calculation, however, a small amount of brushing and miscellaneous work may be necessary between entries (approximately 5–10 years).

[4] Net stumpage value based on three year average (1994–1996) of Stikine Area TSPIRS revenue data.

Other Resource Values

There are no expected significant impacts on resources such as hunting, fishing, recreation, or tourism. Depending on the alternative, there could be a change in the Recreation Opportunity Spectrum and potential for the affected portion of the Project Area to change its potential for designation to Wilderness.

Soils and Geology

The following discussions and analysis are based on data collected in the field and existing data for the Emerald Bay Project (1998), and the Fish and Water Resource Report for the Emerald Bay Project Area (1999). A Forest-wide treatment of soils may be found in the Forest Plan EIS, Chapter 3. Applicable soils direction is included in the Forest Plan, Chapter 4 and Appendix C. The unit and road cards (Appendices B and C of this document) contain additional site-specific implementation requirements.

The soils of the Emerald Bay Project Area are predominantly underlain by till at elevations less than about 1,000 feet. The upper limit of glacial till on the valley sides of the Emerald Bay watershed is about 1,200 feet. The thickness of the till deposits is extremely variable. As elevations increase and slopes steepen, soils are typically less than 20 inches thick and underlain by bedrock. On the broad, gently sloping ridgetops, organic soils have accumulated, typically to depths of more than 2 feet.

Affected Environment

Geomorphology and Geology

The Emerald Bay Project Area topography and landforms are characterized by a small U-shaped valley and broad ridges trending southwest, with a steep ridge running northwest and dropping directly into Ernest Sound. Soils are dominantly well-drained and productive on the valley side slopes supporting hemlock/spruce forests. The broad ridgetops and the valley bottoms are covered with a combination of organic soils supporting bog vegetation and well-drained hemlock/spruce forests.

Karst Resources

Karst is a comprehensive term that applies to the unique topography, surface and subsurface drainage systems, and landforms that develop by the action of water on soluble rock - in the case of Southeast Alaska, limestone and marble. The dissolution of the rock results in the development of internal drainage, producing sinking streams, closed depressions, and other solutional landforms such as sinkholes, collapse channels and caves (White et al. 1995). The Emerald Bay Project Area has no known karst features.

Soil Productivity

Soil productivity in the Project Area is primarily a function of soil drainage and soil depth. Road construction and rock pit development cover areas of soil with rock and overburden, reducing the productivity of the site. Extensive soil disturbance within harvest units can have a detrimental impact on soil productivity. Soil disturbances are areas where felling of trees or yarding of logs has displaced the surface organic mat.

There are currently no roads or rock pits in the Emerald Bay Project Area. If roads are constructed and then abandoned, red alder will grow on most road surfaces of the Project Area.

Forested, poorly-drained organic soils are extensive in the Emerald Bay Project Area; 1,311 acres have been mapped. Concerns with timber harvest on these soils include the ability of the site to grow 20 cubic feet of wood (on average) per acre, per year. The environmental consequences of timber harvest on these sites are discussed in the Water section of this chapter.

Approximately 462 acres of McGilvery soils have been mapped in the Emerald Bay Project Area. These soils consist of well-drained organic matter less than 20 inches thick over bedrock. Dragging logs across areas of thin McGilvery soils can physically displace the soil from a spot or yarding corridor. Field reconnaissance identified several small areas of

McGilvery soils within and adjacent to proposed harvest units. Where soil displacement would likely exceed Regional Soil Quality Standards, the area of McGilvery soil was not included in the harvest unit. This resulted in the removal of two units and portions of two other units.

Surface Erosion and Mass Movement

The relatively thick organic mat covering most mineral soils in the Project Area helps prevent surface erosion. Where the organic mat is displaced or mineral soils exposed, surface erosion can occur. Yarding of logs can displace the organic mat and allow surface erosion of underlying mineral soils. In steep, forested terrain with high soil-water levels, mass wasting (landslide) is the dominant erosion process. Topographic, geologic, and soil conditions usually determine where a landslide will occur; rainfall is probably the principal triggering force determining when landslides will occur.

Steep, forested terrain occurs throughout the Emerald Bay Project Area. An inventory of landslides in another location on the Ketchikan Area found a landslide rate of one slide per 2,812 acres of productive old-growth forest and one slide per 496 acres of harvested second-growth forest. The slides in old growth averaged 0.6 acres and those in second growth 0.2 acres. Over the 20-year period covered by the inventory, five 1-acre landslides occurred on nonforested land.

Naturally unstable areas in the Emerald Bay Project Area include the portions of the lands above 1,000 feet elevation in the Emerald Bay Project Area. The majority of the old-growth landslides occurred in the far east and northwest portions of the Project Area.

The Forest Service uses a mass movement index for preliminary identification of potentially unstable sites in a Project Area. The highest hazard soils (most mineral soils on slopes over 72 percent, and some on slopes over 60 percent) are not included in the suitable timber base. All proposed harvest units with slopes over 50 percent gradient or with some indication of instability were field reviewed by a soil scientist. Numerous areas of instability were identified and excluded from proposed harvest units. The soil scientist's resource report (contained in the planning record) documents the changes made to the initial group of proposed harvest units. Three proposed harvest units contain inclusions of areas with slopes greater than 72 percent considered to have a low landslide potential by the soil scientist and which are thus suitable for timber harvesting. These inclusions, identified on the unit cards (Appendix B) range in size from 1 to 11 acres.

Environmental Consequences

Soil Productivity

Indicators of potential adverse effects on soil productivity include acres of new roads and rock pits, and soil disturbances over 100 square feet. These measures are displayed for each action alternative in Table Soils-1. For roads and rock pits, the analysis assumes 4.8 acres per mile of road, and one 2 acre rock pit for every 2 miles of road. Soil disturbances larger than 100 square feet, called soil displacements, are considered detrimental to soil productivity (Region 10 Soil Quality Standards). The analysis assumes 5 percent displacement for areas where partial suspension yarding is planned and 2 percent displacement for areas where full suspension is planned. These are rough estimates based on timber harvesting on very steep slopes; in all likelihood, soil displacement on gentler slopes will be much less.

Table Soils-1
Effects on Soil Productivity by Alternative

Alternatives	Productivity Loss from Roads (acres)	Displaced Soils from Harvest (acres)	Rock Pits (number)
A	0	0	0
B	36	29	3
C	0	15	0

The intent of the Regional Soil Quality Standards is to maintain soil productivity within acceptable parameters. The Standards allow up to 15 percent of the productive forest land to be in a disturbed condition. For harvest units on much of the Ketchikan area, typically less than 5 percent of the soils in steep slope timber harvest units are left in a disturbed condition. In addition, for the Emerald Bay Project, Marten Standard and Guidelines require forest structure to be retained for all areas ranked as high-value habitat; helicopter yarding will be required to harvest most of the partial-cut units, further reducing potential disturbance. Soil displacements and other potentially adverse impacts to soils within harvest units are anticipated to be within Soil Quality Standards.

Surface Erosion and Mass Movement

Harvest on over-steepened slopes (72 percent or greater) is generally avoided, as these lands are considered unsuitable for timber harvest. Forest Plan Standards and Guidelines allow harvest on over-steepened slopes when on-site analysis determines that the potential for adverse effects is low. Field reconnaissance by the soil scientist has identified specific areas with slopes 72 percent or greater that have low landslide potential. Both action alternatives propose to harvest a total of 14 acres of slopes over 72 percent.

Landslide rates within the Project Area were discussed under "Affected Environment." Factors affecting the landslide rate in future harvest units include the amount of timber harvest on steep slopes and the amount of soil disturbance in harvest units. Log suspension requirements will reduce the amount of soil disturbance, and partial-cut harvest is prescribed for many units, further helping to maintain the root mat in harvested areas.
The analysis here assumes that one landslide will occur in the next 20 years for each 622 acres of timber harvested (or, one landslide per year per each 12,440 acres of harvest.) The average size of the second-growth landslides is 0.2 acres. The analysis also assumes that one 3.1-acre landslide will occur in the next 20 years for each 6,239 acres of old growth. Applying these assumptions to the alternatives, including Alternative A (no-action), results in little difference in estimated landslide effects (occurring over the next 20 years) between alternatives.

Table Soils-2
Estimated Acres of Landslides by Alternative per 20 Year time Period

Alternative	Acres of Old-growth Landslides	Acres of Second-growth Landslides	Acres of Road-related Landslides	Total
A	2.6	0.0	0.0	2.6
B	2.3	0.7	0.2	3.2
C	2.2	0.7	0.0	2.9

Cumulative Effects

Soil Productivity

Assuming virtually all suitable forest land in the Project Area is harvested this entry, the Project Area could have 6.2 miles of road. This is about 36 acres of forest land occupied by roads, or 0.5 percent of the Project Area.

Mitigation

Soil resource protection prescriptions, landslide mitigation measures, and applicable Best Management Practices (BMPs) are listed on unit and road cards. Due to the relatively thick organic mat covering most mineral soils, surface erosion is limited to displaced areas, roads, stream banks and recent landslide tracks. Displaced areas within timber harvest units are routinely slashed and seeded shortly after they occur. Slashing the disturbed site provides soil cover, reducing the force of raindrop impact and the length of exposed slope. Grass seeding and fertilizing the area further provides soil cover and provides some organic matter for soil revegetation. Other BMPs are intended to keep surface erosion to a minimum practicable amount.

Subsistence

The following discussions and analysis are based on the detailed subsistence information and analysis contained in the Forest Plan EIS, Chapter 3: "Subsistence" and "Communities," Appendix H, and the "Deer Harvest Map" in the map packet. See also the Wildlife section of this chapter for additional analysis of deer and other wildlife species.

Affected Environment

Subsistence and ANILCA

Subsistence is a broad term applied to many natural resource uses of rural Alaskans. In the Alaska National Interest Lands Conservation Act (ANILCA), subsistence is defined (in part) as: "the customary and traditional uses by rural Alaska residents of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation" (ANILCA Sec. 803). ANILCA provides for the continuation of these uses "consistent with sound management principles, and the conservation of healthy populations of fish and wildlife" (ANILCA, Sec. 802). For many rural Alaskans subsistence is a way of life; for many rural Alaskans it also carries cultural and religious meaning.

The analysis of subsistence uses and resources on National Forest System lands, and of potential effects resulting from management activities, is also required by ANILCA (Sec. 810). This analysis typically focuses on food-related resources, which are the ones more likely to be affected due to loss or alteration of habitats from land-altering activities. (The identification, protection and interpretation of cultural and historic resources on Federal lands are covered under other legislation, including the National Historic Preservation Act. See the Other Resources and Heritage sections of this chapter.) The analysis also typically focuses on three factors: abundance and distribution of the resources, access to them, and competition for the use of them. Under ANILCA, if it is found that a significant restriction on subsistence resources may occur (from a specific project or cumulatively for a geographic area), additional analysis and findings are required.

The Forest Plan EIS provides a comprehensive analysis of subsistence resources and potential effects, both Tongass-wide and for each rural community of Southeast Alaska. That analysis concluded that Forest-wide, under full implementation of the Forest Plan, the only subsistence resource that may, in the future, be significantly restricted is subsistence use of deer (Forest Plan EIS, pp. 3-224 to 3-229; Forest Plan ROD, pp. 36-37). The following is tiered to this analysis.

Subsistence Resources and Uses

Salmon and trout are the principal subsistence fish resources of the area. They may be harvested in both fresh and saltwater in the Project Area with a State of Alaska fishing license. Alaska Department of Fish and Game does not grant personal use permits for Emerald Creek. Use of salmon and trout in the Project Area is minor. The principal subsistence wildlife resources of the Project Area are probably deer and smaller furbearers such as marten. Except for deer, use of wildlife species for subsistence purposes is relatively minor. (Forest-wide, measured by weight, deer account for 21 percent of subsistence food resources, and all other land mammals 4 percent (Forest Plan EIS, p. 3-224).) Potential effects to any of these fish and wildlife species as subsistence resources are discussed under "Environmental Consequences" below. Other subsistence uses of natural resources may occur. Some examples are cedar bark gathering, berry picking, mushroom gathering, use of native plants for arts and crafts, use of bays and estuaries for shrimp and crab, and collection of other edible plants and animals. Most of these activities are associated with a particular

traditional site. These sites vary in location and are not accurately mapped. The Emerald Bay Project could affect these sites if any fall inside proposed units.

Community use of deer for subsistence purposes is well documented and studied for the rural communities of Southeast Alaska (see Forest Plan EIS, pp. 3-210 to 3-223 and 3-523 to 3-528). Community use of specific geographic areas for obtaining deer is estimated by the wildlife analysis areas (WAAs) used by the State of Alaska. For the purposes of the wildlife analysis of the Emerald Bay alternatives, WAA 1817 will be used to represent harvest patterns for the Project Area (the Emerald Bay Project Area actually corresponds to 12 percent of this WAA).

Community use of each WAA for deer is displayed on the "Community Deer Harvest" map included with the Forest Plan EIS (map packet). The map shows that from 1987-1995, the average reported annual harvest in WAA 1817 was 24 deer. Three communities (or community groupings) were responsible for the entire reported harvest of deer in WAA 1817: Ketchikan (71 percent), Wrangell (17 percent), and Meyers Chuck (12 percent). Community use is further discussed and displayed in the Forest Plan EIS in the "Communities" portion of Chapter 3 (pp. 3-523 to 3-685) and in Appendix H. Appendix H identifies for each community those WAAs (ordered by highest to lowest use) accounting for 75 percent of that community's deer harvest. Of the communities listed above, WAA 1817 shows up for only Meyers Chuck where, on average, 3 of 24 reported harvested deer come from WAA 1817.

It can be said, then, that Meyers Chuck is the only one of the communities representing a substantial portion of the deer harvest occurring in WAA 1817 (12 percent) for which that harvest makes up a substantial portion of its historic deer use (13 percent). (All future demand projections are extrapolations based on current use and population growth.) The discussion of potential effects on the subsistence use of deer in the Project Area will thus focus on Meyers Chuck as the only community potentially significantly affected.

Environmental Consequences

Direct, Indirect and Cumulative Effects

The analysis of effects is based on the ANILCA categories previously mentioned: abundance and distribution, access, and competition. No restrictions on access to the Project Area for subsistence uses are anticipated. The Project Area and the entire WAA are accessible by boat or float plane. The Project Area is 12 air miles from Meyers Chuck, 35 air miles from Wrangell, and 40 air miles from Ketchikan.

Abundance and Distribution

With application of the Riparian Standards and Guidelines of the Forest Plan, no significant adverse effects on salmon or trout species are anticipated under any alternative (see Fish section of this chapter). No significant adverse effects are anticipated for wildlife species, including deer (see Wildlife section of this chapter) for the following reasons:

1. Only about 10 percent (773 acres) of the Project Area (1 percent of the WAA) will be harvested.
2. Most (67 percent) of the Project Area has been designated as a medium Old-growth Habitat Reserve.
3. Forest Plan Standards and Guidelines will be implemented.

Models predict a decline in deer habitat capability of 8 percent under either action alternative. (Details of the analysis of deer habitat effects can be found in the Wildlife section of this chapter.) These declines will occur with the harvest of old-growth timber. This project

will only impact 5-10 percent of the low elevation (<1200 feet below sea level) old growth in the Project Area. Implementation under the Forest Plan will require 1,000-foot beach and estuary fringe no-harvest zones along all saltwater beaches and estuaries, the application of riparian buffers along all streams, and the protection of 67 percent of the Project Area in Old-growth Habitat Reserves. All these result in considerable protection of important deer winter habitat.

Competition

In addition to these measures minimizing loss of key deer winter habitat in the Project Area, deer habitat decline must also be put in the perspective of subsistence use of deer in the area. As discussed under Affected Environment above, only one Southeast Alaska community, Meyers Chuck, relies on subsistence deer harvest in WAA 1817 for a substantial portion (12 percent) of its subsistence food needs. There are several reasons to suspect that this project will have a small, if any, effect on subsistence use of deer: 1) the planned units are 1 mile or more from the beach, 2) the Project Area is only 12 percent of WAA 1817, 3) the Project Area is the portion of WAA farthest from Meyers Chuck, and 4) field visits suggest that deer numbers are higher at Union Bay and Vixen Inlet, which are also closer to Meyers Chuck.

Historic numbers of deer harvested, and potential direct and cumulative effects of full implementation of the Forest Plan in conjunction with the anticipated future demands for deer, are displayed and discussed for each Southeast Alaska community in the Forest Plan EIS. Three levels of deer use are evaluated for each community for those areas (WAAs) the community most relies on: use by community residents only, use by all rural (subsistence) hunters, and use by all hunters (including those from non-rural communities and hunters from out of State, neither of whom are considered subsistence users under ANILCA). Under ANILCA, a priority for use will be granted to rural users if restrictions on use of a resource are necessary. If further restrictions on a use were necessary, then that is the point at which a significant restriction on subsistence uses may occur. Such a restriction could occur from either reduced abundance or increased competition.

In order for an area (in this case a WAA) to produce on the average enough deer for species viability, as prey for other wildlife species (primarily wolf), and for human uses (subsistence and other hunting), deer harvest by humans should not exceed a certain average percentage of the habitat capability for that area. The Forest Plan EIS analysis makes two assumptions in this regard (p. 3-537):

- Hunters in areas where harvest or demand is within 10-20 percent of habitat capability may experience reduced hunter efficiency and moderate difficulty in obtaining deer.
- In areas where demand (or current/historic use) exceeds 20 percent of habitat capability, deer harvest may be restricted either directly or indirectly.

The analysis for Meyers Chuck (Forest Plan EIS, pp. 3-536 to 3-537, and H-65) shows that current (historic) use of WAA 1817 for Meyers Chuck alone is 0.2 percent of habitat capability, and for all rural users 0.4 percent. By the year 2005 (assuming full Forest Plan timber harvest, including the Emerald Bay Project), with habitat capability down slightly and demand up slightly, use by Meyers Chuck residents is at 0.3 percent of habitat capability, and by all rural users 0.5 percent. Thus for short-term cumulative effects (the Emerald Bay Project and all past projects), no restrictions on use by subsistence hunters would occur. (Demand including all hunters, rural, non-rural, and nonresident, is at 1.6 percent in 2005.)

After 100 years of full implementation of the Forest Plan (long-term cumulative effects), demand by Meyers Chuck residents is projected to reach 0.4 percent of habitat capability, and by all rural users of the area to reach 1.0 percent. Demand by all hunters is projected to

be at 3.2 percent.

Based on the preceding analysis, this Draft EIS is concluding that no significant restrictions on any subsistence resource within the Project Area, from past, current and reasonably foreseeable future actions, will occur. A final ANILCA determination will be made in the Project Record of Decision.

Threatened and Endangered Species

The following discussions and analysis are based on and summarized from the Wildlife Resources Report for the Emerald Bay Project Area (1998), a more detailed treatment referenced to the scientific literature. This report also includes the Biological Assessments required for all threatened and endangered species, and the Biological Evaluations required for Forest Service sensitive species. Direction for threatened, endangered and sensitive species is contained in the Forest Plan, Chapter 4.

Affected Environment

Federally listed threatened and endangered species are those plant and animal species formally listed by the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS), under the authority of the Endangered Species Act of 1973, as amended. There are also other species for which concern regarding viability has been expressed (some of these were previously listed as USFWS Species of Concern or Category 2 Candidate species when there was information indicating the species might qualify for endangered or threatened status, but for which further evaluation was needed). The State of Alaska has an Endangered Species law which authorizes the commissioner of the Alaska Department of Fish and Game (ADF&G) to list Alaska endangered species. The Regional Forester can also designate species occurring in National Forests as "Sensitive."

Threatened or Endangered Species

No threatened, endangered, or candidate fish species are found in the freshwater river systems in the Project Area. Two threatened species, the Snake River fall Chinook salmon (Oncorhychus tshawytscha) and the Snake River spring/summer Chinook salmon, and one endangered species, the Snake River sockeye salmon (O. nerka), may be present in the general vicinity in saltwater during the marine rearing period of their life cycle. However, the presence of these Pacific Northwest salmon is not documented for these waters. No threatened, endangered, or candidate plant species are known to occur in the Project Area.

Biological Assessments have been prepared to evaluate the effects of the Proposed Action on three Federally-listed threatened or endangered species. These species are discussed below, based on the information in these assessments. A Biological Assessment for the American peregrine falcon has been submitted to USFWS, and Biological Assessments for the humpback whale and Steller sea lion to NMFS. No other threatened, endangered, or candidate birds or mammals are known to occur in the Project Area.

The Arctic peregrine falcon was delisted in 1994, and the Endangered Species Act requires monitoring of species for five years following delisting. The Arctic peregrine falcon is primarily associated with the area north of the Brooks Range and Seward Peninsula in interior Alaska. It occurs in Southeast Alaska only during migration periods.

Humpback Whale

Humpback whales (Megaptera novaeangliae) are occasionally found in waters bordering the Project Area. The local distribution of humpbacks (listed by NMFS as Endangered) in Southeastern Alaska appears to be correlated with the density and seasonal availability of prey, particularly herring (Clupea harengus) and euphausiids (shrimp-like crustaceans). Important feeding areas include Glacier Bay and adjacent portions of Icy Strait, Stephens Passage/Frederick Sound, Seymour Canal, and Sitka Sound. Other areas of Southeastern Alaska may also be important for humpbacks and need to be evaluated. None of these are within or adjacent to the Project Area.

Steller Sea Lion

Steller sea lions (Eumetopias jubata) are also occasionally found in waters bordering the Project Area. The Steller sea lion (listed by NMFS as Threatened) ranges from Hokkaido, Japan, through the Kuril Islands and Okhotsk Sea, Aleutian Islands and central Bering Sea, the Gulf of Alaska, Southeast Alaska, and south to central California. Information on Steller sea lion population trends in Southeast Alaska is limited, but suggests that Steller sea lion populations are stable in Southeast Alaska. There are no known Steller sea lion haul out areas in the Project Area; the closest is located on the south tip of Grindall Island (at the south tip of Kasaan Peninsula), about 40 miles to the south.

American peregrine falcon

The American peregrine falcon (Falco peregrinus anatum) may migrate through the Project Area. It is listed as Threatened by USFWS. This falcon is primarily associated with interior Alaska for breeding, nesting, and rearing of young. It is highly migratory, wintering as far south as northern Argentina, and it occurs in Southeast Alaska only during migration periods. Population numbers of the American peregrine falcon are continuing to increase; in Alaska, population numbers have increased three-fold since the species was listed.

Sensitive Species

Species listed as sensitive by the Regional Forester that may occur within the Project Area are Peale's peregrine falcon, Queen Charlotte (northern) goshawk, trumpeter swan and choris bog orchid. However, only the trumpeter swan and goshawk among the animal species are expected to occur in the Project Area for extended periods of time. Choris bog orchid populations have been documented in the Project Area. Biological Evaluations, which focus on the likelihood of sensitive species becoming threatened or endangered, are required for potentially affected sensitive species, and have been completed. These are summarized below.

Trumpeter Swan

The trumpeter swan (Cygnus buccinator) is the largest waterfowl species in the world. Its present range is only a vestige of the once vast region of North America that it frequented in both summer and winter. Trumpeter swans breeding in Alaska spend the winter along the Pacific Coast from the Alaska Peninsula to the mouth of the Columbia River, where they take advantage of open waters of saltwater estuaries and freshwater lakes and rivers. Trumpeter swans may be present in the Project Area during the fall, early spring migration period, and winter, although there appears to be little swan habitat in the Project Area. Swans typically leave for their breeding area by mid-April. Swans have not been reported in or near the Project Area during the summer.

Queen Charlotte Goshawk

The Queen Charlotte goshawk (Accipiter gentilis laingi) is a raven-sized raptor associated with forests having tall trees and dense canopies. These features allow goshawks to hunt beneath the tree canopy, and to capture prey before the prey escapes into the trees or shrub layer. The dense canopy in tall trees fosters a more abundant prey species population and provides a microclimate suitable for nesting. Goshawks forage over home ranges that are typically 6,000 to 8,000 acres in Southeast Alaska, though home range may be twice that size in fragmented forests.

The northern goshawk has been a species of concern for all of its range, including the Queen Charlotte subspecies which is present in Southeast Alaska. Following a petition for listing, and appeal of an initial not warranted determination, the USFWS issued a 1997 decision that listing the species as threatened or endangered at this time is not warranted.

Goshawk surveys were completed in 15 potential habitat locations in the Emerald Bay Project Area in April and July of 1998. Surveys followed Tongass National Forest protocols for the northern goshawk. Ten broadcast survey points (11.9 hours) and 5 overlook survey points (6.2 hours) were completed. Field crews observed no goshawks and found no goshawk nests.

Species of Interest

There are several other species of interest potentially inhabiting the Project Area. Two of these are discussed elsewhere: the northern goshawk above, and the Alexander Archipelago wolf in the Wildlife section of this chapter. The others are discussed below.

Keen's Myotis

Records suggest that the range of Keen's myotis (Myotis keenii) is restricted to Pacific coastal forests from western Washington to Southeastern Alaska (Nagorsen and Brigham 1993 and van Zyll de Jong and Nagorsen 1994, as sited by Parker and Cook 1996). Single specimens have been collected at Wrangell, on northern Prince of Wales Island, and at Hoonah (Parker and Cook 1996). Parker and Cook (1996) suggest these bats are year-round residents. Keen's myotis apparently roosts in snags, hollow trees, rock crevices and caves (van Zyll de Jong 1985, and cited in Parker 1996).

Marbled Murrelet

The marbled murrelet (Brachyramphus marmoratus) is a robin-sized seabird that is found throughout the North Pacific; the North American subspecies ranges from Alaska's Aleutian Islands to central and occasionally southern California. The marbled murrelet feeds in near-shore ocean areas, inland saltwater, and occasionally inland freshwater lakes. The bird feeds below the water's surface on small fish and invertebrates. In the Pacific Northwest and Southeast Alaska, the bird normally nests in old-growth forests. Murrelets have been observed in the saltwater within the Project Area, and it is likely that nests exist on land, although no nests have been found in the Project Area.

Based on at-sea surveys, 85 percent of the estimated 300,000 marbled murrelets in North America occur in Alaska, with approximately 96,000 in the Alexander Archipelago (Ralph et al. 1995). Another study (Agler et al. 1995) determined the early-summer, on-water population in Southeast Alaska to be 434,129 (plus or minus 166,525). Marbled murrelet habitat requirements are not well established for Southeast Alaska, but what is known suggests that habitat for regional marbled murrelet populations is adequate.

Harlequin Duck

In Alaska, the harlequin duck (Histrionicus histrionicus) as been reported as a fairly common year-round resident, and at one season or another has been recorded over much of the State except the Arctic coast (Gabrielson and Lincoln 1959). The species appears to breed locally over much of southern Alaska, probably in the Aleutians, and north to Anaktuvuk Pass. Ornithologists who have worked during the spring and summer months in the Alexander Archipelago and other parts of Southeast Alaska have commented upon the numbers of these ducks, frequently stating that they were common or abundant (Gabrielson and Lincoln 1959). Harlequins nest along inland fast-moving rivers and streams, usually within six feet (but up to 60 feet) of water (DeGraaf et al. 1991).

During the winter the harlequin duck is common to abundant in the coastal waters of Southeast Alaska (Gabrielson and Lincoln 1959). Preferred winter habitat is reported to be areas along surf-pounded rocky coasts, rather than sheltered bays and fjords, where water is one to two fathoms deep and turbulent, and where bottom fauna abounds (Palmer 1975). Harlequins feed on mollusks, crustaceans, insects, fish, and echinoderms.

Olive-sided Flycatcher

The olive-sided flycatcher (Cantopus borealis) breeds in wooded regions from central Alaska east to Newfoundland and south to northern Baja California and central Arizona in the west, central Minnesota and northern Michigan in the central states, and North Carolina and Tennessee in the east, and winters in South America. It inhabits open coniferous forests and forest edges along lakes, streams, and muskegs. DellaSala et al. (1993) noted that the species was often observed using habitats associated with lakes and muskegs during a breeding bird study on central Prince of Wales Island.

Spotted Frog

The spotted frog (Rana pretiosa) occurs in or near freshwater including marshy ponds, streams, and lakes (Stebbins 1985). This species is believed to range from south of the Taku River south to other transboundary rivers and some islands of Southeast Alaska and British Columbia (Holmberg 1992). Spotted frogs have been documented in the Stikine River basin (Waters 1992). Amphibian surveys have not been completed on the Project Area, but surveys completed on nearby VCUs on Cleveland Peninsula have not identified any spotted frogs.

Ascending Moonwort Fern

The ascending moonwort fern *(Botrychium ascendens)* occurs widely scattered in grassy fields up to 2,500 meters elevation in British Columbia, Ontario, the Yukon, Alaska, California, Montana, Nevada, Oregon, and Wyoming (Wagner 1993). It is unknown if this species occurs within the Project Area, but there appears to be little habitat.

Environmental Consequences

The following analyses include discussions of the relevant mitigation measures from the Forest Plan. An additional mitigation discussion at the end of this section, as is included in most other Chapter 3 sections, is therefore not included.

Effects on Threatened or Endangered Species

None of the alternatives are anticipated to adversely affect the humpback whale, Steller sea lion, or American peregrine falcon. Biological Assessments for each species are included in the project planning record, and the effects analyses for each are summarized below.

As described below for the American peregrine falcon, no effect on the population or habitat of the Arctic peregrine falcon (delisted in 1994) is anticipated from any alternative.

Humpback Whale

No direct or indirect effects on whales from implementation of forest management activities under any alternative are anticipated. Forest Plan forest-wide Standards and Guidelines for Threatened and Endangered species provide for the protection and maintenance of whale habitats. All activities will be conducted in a manner consistent with the Marine Mammal Protection Act, the Endangered Species Act, and National Marine Fisheries Service regulations for approaching whales, dolphins, and porpoise.

One potential indirect effect has to do with the use of log transfer facilities (LTFs). A portion of the logs harvested from the Emerald Bay Project may be transported using an LTF. Two types of boat activity associated with LTFs, log raft towing and recreational boating by workers, may have an effect on whales. Log raft towing routes are generally well established, and adverse effects from log raft towing have not been documented.

Steller Sea Lion

No areas within the Project Area have been listed by NMFS as critical habitat for Steller sea

lion. No direct or indirect effects on sea lions from implementation of forest management activities under any alternative are anticipated. Forest Plan forest-wide Standards and Guidelines for Threatened and Endangered species provide for the protection and maintenance of sea lion habitats. All activities will be conducted in a manner consistent with the Marine Mammal Protection Act, the Endangered Species Act, and National Marine Fisheries Service regulations for approaching seals and sea lions.

American Peregrine Falcon

The American peregrine falcon occurs in Southeast Alaska only during migration. During migration, the abundance of prey species is likely to be the primary habitat factor affecting peregrine falcons; the primary prey species are thought to be shorebirds, waterfowl, and passerine species. Forest Plan Standards and Guidelines provide for the protection of seabird rookeries and waterfowl concentrations, and a wide variety of passerine (perching and song) birds will be available from numerous open and forested communities under all project alternatives. No adverse effect on American peregrine falcon populations is anticipated from any alternative.

Effects on Sensitive Species

Trumpeter Swan

All Forest Plan Standards and Guidelines for trumpeter swans are incorporated. These direct avoiding any disturbance of trumpeter swans, particularly during nesting, brood-rearing, and wintering periods. If trumpeter swans are found to be using habitat within the Project Area, road building and timber harvesting will not occur within 0.5 miles of used habitat when swans are present (normally from November 1 to April 1).

Queen Charlotte Goshawk

All action alternatives will harvest stands capable of providing nesting and/or foraging habitat for goshawks (i.e., old-growth forests). Alternatives B and C would reduce old-growth forest in the Project Area by about 13 percent from existing conditions. Any clearcut units with high-value marten habitat will maintain 10-20 percent canopy cover under Forest Plan Standards and Guidelines for marten. In contrast to traditional clearcut harvesting, this increase in standing trees left within the units should result in better maintaining goshawk habitat conditions. Partial cut units will likely leave about 50 percent of the trees and/or 50 percent of the basal area. It is not known what the actual effects of timber harvest will be, other than that the total amount of undisturbed old-growth habitat will be reduced. Alternative B will remove the most canopy cover: 492 acres of clearcut harvest and 207 acres of partial harvest. Alternative C will partial harvest 746 acres with a target of leaving 50 percent of the trees and/or 50 percent of the basal area.

There are no confirmed goshawk nesting sites in or near the Emerald Bay Project Area. However, goshawks are extremely difficult to locate and it is possible that the Project Area includes one or more breeding territories. Any goshawk nests found during field reconnaissance or unit layout will be protected from harvest by implementing Forest Plan Standards and Guidelines for goshawks. These require the maintenance of an area of not less than 100 acres of productive old-growth forest (if it exists) generally centered over the nest tree or probable nest site, preferably with a multi-layered, closed canopy and providing foraging opportunities for young goshawks. No commercial timber harvest is permitted, and no continuous disturbance likely to result in nest abandonment is permitted within the surrounding 600 feet from March 15 to August 15. Activity restrictions are removed for active nests that become inactive or are unsuccessful.

Northern goshawk is discussed above, and the Alexander Archipelago wolf is discussed in the Wildlife section of this chapter. The following effects analysis is summarized from the Project Biological Evaluations and Wildlife Resource Report.

Effects on Other Species of Concern

Keen's Myotis

Timber harvest could remove potential habitat of Keen's Myotis in the form of snags and hollow trees. The amount of habitat removed could affect individuals of the species, but is not expected to negatively affect population viability.

Marbled Murrelet

All action alternatives will harvest stands capable of providing nesting habitat (old-growth forest) for marbled murrelets. Alternatives B and C would reduce old-growth forest in the Project Area by about 13 percent from existing conditions. However, even if the breeding population were reduced in proportion to the percentage of productive old-growth forest harvested under the action alternatives, populations in the Emerald Bay Project Area would not be greatly changed, and any effects on the estimated Southeast Alaska population of marbled murrelets (434,000 plus or minus 166,000) would be negligible. (See also the previous discussion of timber harvest and canopy requirements under northern goshawk.)

Any nests located during field reconnaissance or unit layout will be protected from timber harvest and blowdown under Forest Plan Standards and Guidelines. A 600-foot buffer is required around each known nest, with disturbance activities minimized during the nesting season, and the buffer zone would be maintained and monitored for at least two nesting seasons following discovery, if harvest in the buffer is considered. If the nest remains inactive for more than two years, the buffer protection may be removed.

Harlequin Duck

Nesting habitat for harlequin duck occurs along inland rivers and streams. Riparian habitats along all potentially affected rivers and streams in the Project Area are protected under Forest Plan Standards and Guidelines for riparian areas, and nesting habitat requirements are expected to be maintained. Winter habitat occurs in the marine environment, in areas of high surf and rocky beaches. No adverse effects are anticipated.

Olive-sided Flycatcher

Olive-sided flycatchers may occur in the Project Area along some of the forest edges in the spring, summer, and fall. Olive-sided flycatchers are not considered an old-growth associated species. Edge habitat alterations will be insignificant, and the project is not anticipated to affect olive-sided flycatchers or their habitat.

Spotted Frog

Riparian habitats along all lakes, rivers, and streams will be maintained through implementation of Forest Plan Standards and Guidelines for riparian areas. This species is not likely to occur in the Project Area, and no effect on the spotted frog is anticipated under any alternative.

Ascending Moonwort Fern

It is unknown if this species occurs in the Project Area. Little potential habitat occurs in the area. Undetected specimens could potentially be affected by harvest activities, but effects are not likely to cause a trend towards listing the species.

Transportation

Affected Environment

Access to Cleveland Penninsula and the Emerald Bay Project Area is by small plane, helicopter and boat. There are presently no roads or public access to this area.

Forest Road System

National Forest roads are classified based on current or anticipated use into one of two maintenance levels. (Roads may also be obliterated or otherwise returned to an unroaded condition after use.) Maintenance levels incorporate traffic service levels, as indicated in the following definitions. Applicable maintenance levels for the Project Area are:

- Maintenance Level 1 (Traffic Service Level D) - Roads are closed by bridge removal or organic encroachment and are monitored for resource protection. Basic custodial maintenance is performed to perpetuate the road and to facilitate future management activities.
- Maintenance Level 2 (Traffic Service Level C) - Roads are maintained for high-clearance vehicles and monitored for resource protection. Traffic will be minor, consisting of administrative uses.

Environmental Consequences

The effects of the transportation system on other resources are considered in the specific resource sections (Fisheries, Soils, Subsistence, Water, and Wildlife). This section focuses on the effects of each alternative on the transportation system, and discusses post-project access management. The Emerald Bay Project does not include a proposal for or analysis of a State road corridor or any other transportation or utility system project within the Transportation/Utility System Land Use Designation.

Road Development

Table Transportation-1 displays the miles of new roads by alternative. New road construction consists of the construction of approximately 6.2 miles of road in Alternative B from a new log transfer facility located in the Emerald Bay area.

Table Transportation-1
Miles and Cost of New Road by Alternative

	Alternative A		Alternative B		Alternative C	
	Miles	Cost MM $	Miles	Cost MM$	Miles	Cost MM$
System Roads	0	0	6.2	0.87	0	0

Source: GIS query

Access Management

After the completion of harvest activities, roads are managed as necessary to control the type of use and kind of traffic. This is called access management. Road access is managed to prevent damage to the roadway, and to meet objectives for resources such as fish, water quality and wildlife, while maintaining public uses and access for timber management and related activities. The Ketchikan–Misty Fiords Ranger District access management program includes public and agency involvement, and interagency evaluation of road management objectives.

The following access management categories apply:

- Encourage - Motor vehicle use is encouraged by appropriate signing, public notification, and active maintenance of the road prism.
- Accept - Motor vehicle use is allowed but not encouraged, while the road is maintained for administrative access.
- Discourage - Motor vehicle use is discouraged by allowing alder growth at road entrance, nonremoval of blowdown, or road prism deterioration within acceptable environmental limits (depending on designated maintenance level). To discourage use, the road may also be signed as "Not Maintained for Motor Vehicle Traffic."
- Eliminate - Motor vehicle use is eliminated by physically blocking the road. Where prescribed for long-term intermittent roads, this strategy is achieved by placement of impassable barricades at road entrances. On short-term roads, removal of drainage structures effectively blocks vehicle traffic.
- Prohibit - Motor vehicle use is prohibited by a road order (Code of Federal Regulation closure). Implementation of this strategy on remote road systems may require the installation of gates, in addition to public notification and appropriate signing.
- Prohibit Seasonally - Road is closed to motor vehicle use at times during the normal operating year. Seasonal prohibitions may be used as necessary to mitigate impacts to wildlife and subsistence resources (e.g., closure during either-sex deer hunting season). Administrative and permitted use of the roads may continue during closure periods, but only for specific permitted uses. Seasonal closures may be used in combination with cooperative efforts with fish and game protective agencies.

Specific post-harvest traffic strategies for access management are described here with regard to fisheries, wildlife, and recreation concerns. Access into newly-entered drainages would be eliminated to minimize resource impacts, unless there is an ongoing silvicultural need. In the latter case, other road uses would be less than the traffic of the harvest activity and would be incidental to the ongoing silvicultural activities. Roads are closed for several reasons, including fish and wildlife protection and lack of maintenance funding. Roads under Forest Service jurisdiction can be closed by regulation (36 CFR 36 212.7 and 261). Applicable law confers a statutory right of entrance to public lands to search for minerals, and access to mining claims (the Project Area has none at present) would not be restricted. However, miners and prospectors would be required to obtain a permit to use restricted roads.

The access management strategy proposed for the Emerald Bay Project Area was developed with the following key points:

- Road use would in general be to "eliminate" rather than "prohibit" road use (see definitions above). Formal CFR road closures (prohibiting use) are not currently planned for any roads, but could be required in the future if use is detected.
- All newly-constructed roads would be closed. All roads would generally be placed in storage and all drainage structures would be removed. This equates to a Alaska Forest

Resource Protection Regulation (AFRPR) status of "closure."

To meet access management objectives, all new roads built for timber harvesting would be closed after the completion of harvest activities.

Efforts to minimize the visual impacts created by logging roads and landings are made during project planning and implementation. Where feasible, roads and landings with a visual quality objective of Modification will be located to minimize or eliminate their visibility.

Log Transfer Facilities

The log transfer facility (LTF) site at Emerald Bay would be used to implement any of the Emerald Bay timber sales under Alternative B. Further discussion on LTFs can be found in the marine section.

Mitigation

Mitigation measures for forest resources applicable to road location, construction and/or design are specified on the unit and road cards (Appendices B and C). These follow the requirements of the Forest Plan, the Best Management Practices, and other direction. Many of these are discussed under the specific resource sections of this chapter.

A major consideration for roads is the need for construction timing restrictions to minimize potential effects to young fish and fry. The Ketchikan–Misty Fiords Ranger District has developed several options to increase the length of the construction window, based on previous project experience. These include the installation of a log stringer bridge, which allows equipment to cross a creek without any instream construction; for small, non-fish bearing streams, damming and diverting water around the site during culvert placement and rocking; and installing culverts or bridges during low flow periods or when streams are frozen. District biologists are consulted to determine appropriate options for each site.

3 Environment and Effects

Water

The following discussions and analysis are based on and summarized from the Soil, Floodplain, Riparian, and Wetland Resources Report for the Emerald Bay Project (1999), and the Water and Fish Resource Report for the Emerald Bay Project Area (1999). A Forest-wide treatment of water resources may be found in the Forest Plan EIS, Chapter 3. Applicable water quality direction is included in the Forest Plan, Chapter 4 ("Riparian" and "Soil and Water") and Appendices C, D and J. The unit and road cards (Appendices B and C of this document) contain additional site-specific implementation requirements.

The water-related resources of the Emerald Bay Project Area include floodplains, riparian areas (including streams, lakes and ponds), and wetlands. The effects of past timber harvest activities on the Emerald Bay drainage are minimal. Floodplains are not proposed for timber harvest or road construction under any of the alternatives. It is unlikely that future timber harvesting or roading will be proposed in floodplains or on alluvial fans. Additional analysis relative to riparian areas may be found in the Fisheries section of this chapter.

Affected Environment

Riparian Management Areas

Riparian areas are lands adjacent to streams, lakes and ponds that are either influenced by groundwater from the water body, or are lands that can directly influence the water quality of a water body when ground disturbing activities occur. Riparian areas can include both upland and wetland areas adjacent to water bodies or streams. Riparian areas also include floodplains and alluvial fans, and areas below the slope-break on V-notches or gorge channels.

Wetlands

Stream process groups are groups of streams that share similar formative processes and stream channel characteristics. Process groups reflect the long-term interaction of geology, landform, climate, and riparian vegetation. The Riparian Standards and Guidelines in the Forest Plan are specific to stream process groups.

Wetlands are defined as "those areas that are inundated or saturated by surface or groundwater with a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions" (40 CFR 230.41 (a)(1)). "Frequency and duration" of a groundwater table sufficient to support a prevalence of hydrophytic plants can include areas where the groundwater table is 12 inches below the soil surface for as little as two weeks during the growing season. In the Emerald Bay Project Area, many wetlands are not associated with streams or lakes and include no surface water areas, while others are intimately associated with lakes or ponds. Some wetlands are dependant on ponds and lakes for recharge water, while some are not.

The Emerald Bay Project Area covers 7,845 acres, of which approximately 71 percent, or 5,557 acres have been mapped as wetlands. Map interpretations include somewhat poorly drained soils on relatively steep slopes that do not always meet the hydrology criteria for classification as wetlands. Field reconnaissance indicated that this mapping overestimates the actual amount of forested wetlands on steeper slopes. The most common wetland types are forested wetlands (1,729 acres), a forested wetland/non-wetland complex (1,779 acres), a forested wetland/short sedge complex (1,346 acres), and alpine shrub/short sedge (244 acres). Past timber harvest has not occurred on wetlands in the Project Area.

Table Water-1
Acres of Wetlands by Wetland Habitat Type

Wetland Habitat	Acres
Alpine Shrub / Short Sedge	244
Short Sedge Wetland	156
Lakes and Ponds*	71
Forested Wetland	1,729
Forested Wetland / Short Sedge Complex	1,346
Forested Wetland / Non-wetland Complex	1,779
Forested Scrub-shrub / Short Sedge Wetlands	232
Total Wetlands	**5,557**
Forested Non-wetlands	2,289
Total Acres**	**7,846**

* Lakes and ponds are considered deep water habitats, but are shown here for display purposes.
** Totals may not match due to rounding.

Forested wetlands on organic soils are very low-volume, low-productivity sites, but can support lower-volume commercial timber. While forest regeneration is initially rapid on these sites, growth slows dramatically as the root systems of the young trees expand into saturated soils. The ROD for the Forest Plan removed large areas of these soils from the tentatively suitable timber base until a study of forest growth on these sites is completed. Approximately 3,125 acres of forested, poorly-drained organic soils occur in the Project Area.

Wetland value (socioeconomic benefit) is largely dependant on the human use or perceived benefit to be derived from wetland functions (hydrologic, bio-chemical and biologic functions such as erosion control and sediment storage, element recycling and maintenance of water chemistry, and providing terrestrial and aquatic habitats).

The Emerald Bay Project Area was field reviewed for three high-value wetland habitat types: estuaries, tall sedge fens, and sphagnum bogs. Two of the three high-value wetland types occur on the Emerald Bay Project Area. There are approximately 16 acres of estuary at the mouth of Emerald Creek. Estuaries do not show up in Table Water-1 because the Project Area shoreline excludes all of the estuary. Estuaries are regionally recognized as the most important wetland type for the fisheries, wildlife and marine habitat they provide. Forest Plan Standards and Guidelines do not allow timber harvest within 1,000 feet of an estuary.

No tall sedge fens are mapped on the Emerald Bay Project Area. During Project reconnaissance, a small tall sedge fen was identified adjacent to the main stem of Emerald Creek

downslope of Unit 11. Tall sedge fens filter large amounts of groundwater and are usually found on the footslope or adjacent to floodplains. Tall sedge fens are included in the Riparian Standard and Guidelines buffer for floodplain process group channel types. The tall sedge fen will be excluded from harvest activity.

No sphagnum bogs are mapped on the Emerald Bay Project Area and none were identified during Project reconnaissance. Sphagnum bogs are very poorly-drained organic soils derived from a relatively undecomposed accumulation of sphagnum moss. Sphagnum bogs are extremely wet and often are associated with very small ponds of standing water. Sphagnum bogs are considered high-value wetlands because of their regional scarcity.

Environmental Consequences

Riparian Management Areas

The Forest Plan Standards and Guidelines for riparian areas generally exclude timber harvest from the riparian areas along all Class I, II and III streams (all fish streams and non-fish streams with immediate influence on fish streams). Class IV streams (streams that lack the ability to immediately influence downstream fish habitat and water quality) may be considered for timber harvest. Class IV streams within the Project Area occur in units receiving both clearcut and partial-cut harvest prescriptions. Specific riparian area protection measures and application of Best Management Practices (BMPs) are documented on the road and unit cards (Appendices B and C), and in the soil and fisheries resource reconnaissance reports, contained in the Project planning record.

The potential for windthrow of trees left within harvest units and riparian areas is addressed in the silvicultural prescriptions on unit cards (Appendix B). For all units that receive partial cut harvest, it is anticipated that the residual trees left within harvest units will improve the windfirmness of trees left within riparian management areas.

Wetlands

The high density of wetlands in the Emerald Bay Project Area makes complete avoidance of wetlands impossible while implementing either of the two action alternatives. Many of the remaining forested wetlands on organic soils do not support commercial or economic stands of timber. During Emerald Bay Project reconnaissance, proposed timber harvest on poorly-drained organic soils was investigated on a case-by-case basis. Large areas of poorly-drained organic soils were removed from proposed timber harvest units. Small areas of poorly-drained organic soils were considered on a case-by-case basis, and removed from harvest units where appropriate. Of the rest of the forested wetlands, up to 614 acres are considered for timber harvest in the alternatives. The amounts actually proposed for the action alternatives are displayed in Table Water-2.

Harvesting timber from forested wetlands causes a temporary increase in soil moisture until equivalent transpiration and interception surfaces are reestablished. The partial-cut harvest proposed for all units will keep some of the evapotranspiration surfaces intact. Tree growth on forested wetland sites is expected to be slower than on adjacent upland sites.

Table Water-2
Acres of Proposed Harvest on Forested Wetlands by Wetland Habitat Type and Major Watershed by Alternative

Wetland Habitat	Alternative B Acres Clearcut	Alternative B Acres Partial Cut	Alternative C Acres Clearcut	Alternative C Acres Partial Cut
Forested Wetland	142	14	0	161
Forested Wetland / Short Sedge Complex	35	11	0	49
Forested Wetland / Non-wetland Complex	101	97	0	228
Forested Scrub–shrub / Short Sedge Wetland Complex	8	26	0	34
Total	**286**	**148**	**0**	**472**

The frequency of wetlands within the Project Area also makes total avoidance of road construction in wetlands difficult or impossible under Alternative B. Table Water-3 displays the miles and acreages of wetland road construction in Alternative B. Roads through wetlands can affect the flow and reach of water in the wetland. The degree of impact depends largely on the wetland type and the road construction materials and methods. Placement of culverts and the use of coarse rock roads helps to maintain the flow and reach of water. Road location has avoided all high-value wetlands.

Table Water-3
Miles of Proposed Road on Wetlands for Alternative B and Acres Impacted

Wetland Habitat	Miles	Acres
Forested Wetland	1.4	6.8
Forested Wetland / Short Sedge Complex	2.0	9.7
Forested Wetland / Non-wetland complex	0.6	2.9
Total	**4.0**	**19.4**

The road cards (in the Project planning record) discuss specific wetland avoidance, minimization, and mitigation measures, as well as the wetland functions considered in the road location. Any roads constructed in the Emerald Bay Project Area will be closed after harvest is completed. The new road construction proposed under the alternative meets the silvicultural exemption requirements of the Corps of Engineers 404 (b) (1) permitting process.

Emerald Bay Drainage

The floodplains of the Emerald Bay drainage will not be affected by planned harvest, and riparian areas will be excluded from timber harvest under Forest Plan Standards and Guidelines. The Emerald Bay drainage has the majority of the Project Area's high gradient contained streams, and blowdown could occur in up to 5 percent of the riparian areas of these streams adjacent to harvest units (see previous discussion of riparian area effects). Timber harvest on forested wetlands in the Emerald Bay drainage is proposed for all action alternatives. See Table Water-2.

Cumulative Effects

Riparian Areas

Timber harvest proposed under the two action alternatives will leave trees standing below the slope-break on streams within V-notches. To reduce the chance of windthrow, a variety of silvicultural prescriptions are used for stands adjacent to V-notches to better achieve windfirmness of the remaining trees. Partial-cut prescriptions will provide additional windfirmness. However, some windthrow is still likely within some of the riparian areas associated with the high-gradient contained streams. For estimating cumulative effects, it is assumed that all remaining suitable timber lands will be harvested by 2054, and that during that time our understanding of how to provide reasonable assurance of windfirmness will improve. It is anticipated that blowdown could occur in about 5 percent of riparian forests adjacent to high-gradient contained streams in the future, or along about 1.5 miles of streams.

Wetlands

To estimate cumulative effects of timber harvest and associated roads on wetlands, the same assumption of harvest by 2054 is used. The effects of timber harvest on the beneficial functions of forested wetlands are in most cases expected to be temporary, especially in the case of those harvested using uneven-aged management. Currently there are no roads across wetlands, and the Emerald Bay Project could bring that total up to 6.2 miles (under Alternative B).

Mitigation

Water-related (including riparian areas and wetlands) resource protection prescriptions and applicable BMPs are listed on unit and road cards (Appendices B and C), and in the fisheries and soil resources reconnaissance reports (all contained in the Project planning record). The Beach and Estuary Fringe, Riparian, Soil and Water, and Wetlands Standards and Guidelines of the Forest Plan all apply. The Region 10 Soil and Water Conservation Handbook includes all BMPs applicable in Alaska and provides additional direction for Project implementation.

3 Environment and Effects

Wildlife

The following discussions and analyses are based on the Wildlife Resources Report for the Emerald Bay Project Area (1998) which includes the Biological Assessment and Evaluation for the Project Area (see Threatened, Endangered and Sensitive Species), and a more detailed treatment referenced to the scientific literature. A related wildlife analysis is contained in the Forest Plan EIS, Chapter 3 and Appendix N. Applicable wildlife direction is included in the Forest Plan, Chapters 3 (Land Use Designations) and 4 (Forest-wide Standards and Guidelines) and Appendix K. The unit and road cards (Appendices B and C of this document) for the Emerald Bay Project contain additional site-specific implementation requirements.

Affected Environment

The natural vegetation of the Emerald Bay Project Area is a mosaic of coniferous forest interspersed with alpine tundra, muskeg (bog), shrubland, estuarine, and beach fringe plant communities. A small portion (approximately 14 acres) of the Old-growth Habitat Reserve near the estuary was harvested approximately 60 years ago. Single-tree beach harvest has historically taken place in the Project Area.

There are two small Old-growth Habitat Reserves, in VCUs 5260 and 7220, adjacent to the Project Area. The location and landscape function of these reserves was evaluated during interagency and interdisciplinary meetings in 1998 and 1999. No changes to the small Old-growth Habitat Reserves were recommended. Specifics on the small reserves are discussed in the Biodiversity and Old Growth section of this chapter.

Management Indicator Species (MIS)

Management Indicator Species (MIS) are species of vertebrates and invertebrates whose population changes are believed to best indicate the effects of land management activities (USDA Forest Service 1982). MIS are used to assess maintenance of population viability (the ability of a population to sustain itself naturally), biological diversity, and management of game (Forest Plan EIS).

The following have been selected as MIS for this project and will be discussed in this chapter:

Species	Basis for Selection
Sitka black-tailed deer	Important subsistence, game species
marten	Old-growth habitat; important furbearer

Sitka Black-tailed Deer

The Sitka black-tailed deer was chosen as an MIS because it is an important game and subsistence species and is associated with old-growth forests. Research conducted in Southeast Alaska indicates that high-volume, mature forests at lower elevations are needed to sustain deer populations during severe winters (Schoen et al. 1985; Hanley and Rose 1987; Yeo and Peek 1992). (The Forest Plan divides productive old growth into three volume strata: high, medium, and low. These are defined and discussed on pages 3-19 of the Forest Plan EIS.) Large, strong branches of mature stands intercept snow and maintain available forage. Productive, higher-volume stands of old-growth forests support the largest biomass of herb and shrub forage (Alaback 1982). Deer populations are impacted by the combination of

deep-snow winters and large amounts of winter range converted to second growth. Snow reduces or eliminates forage availability in young clearcuts. Closed canopy young-growth stands provide little forage in all seasons.

An interagency model (Suring et al. 1992) was developed to evaluate the potential quality of winter habitat for Sitka black-tailed deer. The model was updated for the Forest Plan revision. Further updates specific to this Project Area include the following: 1) 125 deer/square mile was used as the multiplier; 2) predation was included as a factor in the model; and 3) the forest suitability layer has been updated to reflect field-verified suitability. Model outputs are expressed here as relative values with optimal habitat receiving a score of 1.0 and areas that provide no habitat for deer receiving a score of 0.0. The Emerald Bay Project Area currently receives a score of 0.26 for deer habitat capability. Because there has been little human- or naturally-induced large-scale disturbance, habitat capability for deer has probably remained about the same over the last 100 years.

Marten

The marten was selected as an MIS because of its association with old-growth and because it is an important furbearer. According to reports from Alaska Department of Fish and Game, marten populations are considered moderate in the Project Area (D. Larsen pers. comm.). The Forest Plan identifies high-value marten habitat as high-volume, old-growth forest below 1,500 ft. elevation. The Project Area currently contains 2,108 acres of old-growth forest meeting the criteria for high-value marten habitat.

Marten are easily trapped and can be over-harvested, especially where trapping pressure is heavy and not effectively controlled. This corresponds closely to the availability of road access. Marten densities decrease (due to their susceptibility to over trapping) when road densities exceed 0.2 miles of road per square mile, and marten densities will be reduced by as much as 90 percent when road densities approach 0.6 miles of road per square mile. There are currently no roads on the Project Area.

An interagency model (Suring et al. 1992) was developed to evaluate the potential quality of habitat for marten. The model was updated for the Forest Plan revision. Further updates specific to this Project Area include the following: 1) 2.71 marten/square mile was used as the multiplier; and 2) the forest suitability layer has been updated to reflect field-verified suitability. Model outputs are expressed here as relative values with optimal habitat receiving a score of 1.0 and areas that provide no habitat for marten receiving a score of 0.0. The Emerald Bay Project Area currently receives a score of 0.53 for marten habitat capability. Because there has been little human- or naturally-induced large-scale disturbance, habitat capability for marten has probably remained about the same over the last 100 years.

Environmental Consequences

Effects on Wildlife Habitat

Alternative A, the no-action alternative, proposes no timber harvest and thus has no effect on existing habitat. The amount of timber harvest for the action alternatives is 699 acres for Alternative B and 746 acres for Alternative C (see Table Wildlife-1). This is 13 percent and 14 percent of the remaining productive old-growth forest in the Project Area. Under Alternative B, most (12 of 22) sub-units would be clearcut harvested, but this could differ from traditional clearcutting on those acres that are high value marten habitat because 10-20 percent of the original stand structure of each unit will be retained. The retained trees will most likely be in clumps or "islands" within a unit, or may be more evenly spaced. In either case, the actual opening created will be smaller than the unit size, and mature trees will

remain as part of the unit. Alternative B has more sub-units (22) of smaller average size (32 acres) when compared to Alternative C (Table OG-3). Under Alternative C, all 13 Emerald Bay sub-units would be partial harvested and helicopter yarded. All harvest units with high value marten habitat are designed to retain at least 10-20 percent canopy closure consistent with the Marten Standard and Guidelines (discussed in the Threatened, Endangered and Sensitive Species section of this chapter). Harvest objectives for marten (Forest Plan), pp. 4-118 to 4-119) include the following:

- Retain 10-20 percent of the original stand structure.
- An average of at least 4 large trees/acre.
- An average of at least 3 large decadent trees/acre.
- Remaining trees should be uniformly distributed throughout the stand, but trees may be clumped for operational concerns or ecological opportunities.
- Retained trees should have a reasonable assurance of windfirmness.
- Retain 3 pieces/acres of large down trees.

Compared to traditional clearcut harvest, these partial harvest requirements will mitigate some effects to old-growth associated species in that some forest canopy is provided along with large living and decadent (snag) trees. They will not mitigate effects to species preferring a more closed, unfragmented habitat. Although each action alternative includes harvest of forested wildlife habitat, some key habitats are protected by Forest Plan Standards and Guidelines (Table Wildlife-4). These include most riparian management areas (the exception being along Class IV streams), and all beach fringe and estuary fringe habitats. The majority (67 percent) of the Project Area has been designated as a medium Old-growth Habitat Reserve (see Biodiversity and Old Growth).

Table Wildlife-1
Direct effects on Wildlife Habitats (Acres Harvested)

	Alternative A	Alternative B		Alternative C	
		Clearcut	Partial Cut	Clearcut	Partial Cut
Productive Old-growth (POG)	0	492	207	0	746
High-volume POG	0	221	92	0	333
Forested Wetland	0	286	148	0	472

Source: GIS database

Effects on MIS

The previous section discusses changes to wildlife habitats used by Project Area species, including management indicator species. This section discusses how those changes affect the potential habitat capability for each MIS.

Sitka Black-tailed Deer

As noted previously, the deer model estimates the capability of habitats to support deer and does not reflect actual populations in the Project Area. Model outputs are more useful for comparing relative changes by alternative than indicating actual effects to wildlife species. The Emerald Bay action alternatives would decrease deer habitat capability by 8 percent (Table Wildlife-2).

Table Wildlife-2
Habitat Capability Changes for Sitka Black-tailed Deer

	1954	1998	Alt. A	Alt. B	Alt. C
HSI* Score	0.26	0.26	0.26	0.24	0.24
% change		0	0	–8	–8

* HSI—Habitat Suitability Index

Marten

Timber harvest units in the action alternatives will retain overstory structure consistent with Marten Standard and Guidelines. All harvest treatment on high-value marten habitat will retain at least 10-20 percent canopy closure. Units which fall into the high-volume strata and below 1,500 feet elevation are considered high-value marten habitat. Even with partial-cut harvest, these units will fall out of the high-value habitat component since they are no longer high-volume stands. Thus any timber harvest in high-value marten habitat will reduce that habitat accordingly. As noted previously, the marten model estimates the capability of habitats to support marten and does not reflect actual populations in the Project Area. Model outputs are more useful for comparing relative changes by alternative than indicating actual effects to wildlife species. The Emerald Bay action alternatives would decrease marten habitat capability by about 10 percent (Table Wildlife-3).

Table Wildlife-3
Habitat Capability Changes for Marten

	1954	1998	Alt. A	Alt. B	Alt. C
HSI Score	0.53	0.53	0.53	0.48	0.47
% change		0	0	–10	–11

The amount of timber harvest in high-value marten habitat is similar under both action alternatives: Alternative B harvests 312 acres of high-value marten habitat, which represents a 15 percent reduction in high-value marten habitat within the Project Area. Alternative C harvests 336 acres (16 percent) of the high-value marten habitat within the Project Area. Under Alternative B, 220 acres of high-value marten habitat will be clearcut harvested and 92 will be partial harvested. Under Alternative C, 336 acres of high-value marten habitat will be partial harvested.

Cumulative Effects

Table Wildlife-4 shows the cumulative effects on forest habitat assuming all currently unharvested suitable and available timber lands (957 acres) are harvested over the next 5 decades. Total productive old-growth forest remaining would be approximately 4,317 acres. This is 82 percent of the productive old-growth forest originally in the Project Area (prior to 1954).

Table Wildlife-4
Cumulative Effects to Wildlife: Habitat Components in 2054

Year	Productive Old-growth (POG) (acres)	High-volume POG (acres)	Deer Habitat Capability (# of Deer)	Open Road Density (miles per sq. mi.)
1954	5,274	2,366	0.26	0.0
2054	4,303	1,939	0.23	0.0*
% Change	–18%	–18%	–10%	

* Assumes that if Alternative B is selected, all 6.2 miles of road constructed will be closed after project completion.

Assuming harvest of the remainder of the suitable and available timber in the Project Area by 2054, habitat capability for deer would decline to 0.23, a reduction of 10 percent from the current level. This would provide habitat for about 28 deer per square mile, well above the 13 per square mile level recommended as the minimum for providing prey for wolves.

Although 6.2 miles of road would be constructed under Alternative B, open road density would remain at 0.0 miles of road per square mile because all roads would be closed after project completion.

Mitigation

The primary wildlife direction is included in the Forest Plan, Chapters 3 (Land Use Designations, including Old-growth Habitat) and 4 (the Forest-wide Standards and Guidelines), and Appendix K. The unit and road cards (Appendices B and C of this document) for the Emerald Bay Project contain additional site-specific implementation requirements. After project completion, any new project roads will be closed.

Chapter 4

Lists

Chapter 4

Lists

Preparers

The following is a list of contributors to the Emerald Bay Draft Environmental Impact Statement. Other Forest Service employees contributed to the completion of this document through their assistance in support functions. Their help is greatly appreciated.

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Glossary

Access
The opportunity to approach, enter, and make use of public lands.

Access Management
Acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands (physical attributes).

Active Channel
Unstable portion of a stream where stream channels are frequently changing course.

Adfluvial Fish
Species of populations of fish that do not go to sea, but live in lakes, and enter streams to spawn.

Aerial Harvest Systems
Harvesting methods in which the cut logs are moved from the stump to the loading area or log deck without touching the ground, for example, helicopter logging.

Alaska National Interest Lands Conservation Act (ANILCA)
Passed by Congress in 1980, this legislation designated 14 National Forest Wilderness areas in Southeast Alaska. The Alaska National Interest Lands Conservation Act of December 2, 1980, Public Law 96-487, 96th Congress, 94 Stat. 2371-2551, Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

Native Claims Settlement Act (ANCSA)" -spanAlaska Native Claims Settlement Act (ANCSA)
Public Law 92-203, 92nd Congress, 85 Stat. 2371-2551. Approved December 18, 1971, Native Claims Settlement Act (ANCSA)" -spanANCSA provides for the settlement of certain land claims of Alaska Natives and for other purposes.

Alluvial Fan
A cone-shaped deposit of organic and mineral material made by a stream where it runs out onto a level plain or meets a slower stream.

Alpine
Parts of mountains above tree growth and/or the organisms living there.

Alternative
One of several policies, plans, or projects proposed for decision making.

Anadromous Fish
Anadromous fish (such as salmon, steelhead, and sea-run cutthroat trout) spend part of their lives in freshwater and part of their lives in saltwater.

Anadromous Species
One whose individuals are born in freshwater but migrate to and feed in the sea before returning to freshwater to breed.

Background
The distant part of a landscape. The seen or viewed area located from 3 or 5 miles to infinity from the viewer. (See "Foreground" and "Middleground".)

Bedload
Sand, silt, and gravel, or soil and rock debris rolled along the bottom of a stream by the moving water.

Best Management Practice (BMP)
Practices used for the protection of water quality. BMPs are designed to prevent or reduce the amount of pollution from nonpoint sources or other adverse water quality impacts while meeting other goals and objectives. BMPs are standards to be achieved, not detailed or site-

specific prescriptions or solutions. BMPs as defined in the USDA Forest Service Soil & Water Conservation Handbook are mandated for use in Region 10 under the Tongass Timber Reform Act.

Biological Diversity (Biodiversity)
The variety of life in all its forms and at all levels. This includes the various kinds and combinations of: genes; species of plants, animals, and microorganisms; populations; communities; and ecosystems. It also includes the physical and ecological processes that allow all levels to interact and survive. The most familiar level of biological diversity is the species level, which is the number and abundance of plants, animals, and microorganisms.

Biological Potential
The maximum possible output of a given resource limited only by its inherent physical and biological characteristics.

Blowdown
See windthrow.

Board Foot (BF)
A unit of wood 12" X 12" X 1". One acre of commercial timber in Southeast Alaska on the average yields 28,000-34,000 board feet per acre (ranging from 8,000-90,000 board feet per acre). One million board feet (MMBF) would be the volume of wood covering 1 acre 2 feet thick. One million board feet yields approximately enough timber to build 120 houses or 75,555 pounds of dissolving pulp.

Bole
Trunk of the tree.

Braided Streams or Channels
A stream flowing in several dividing and reuniting channels resembling the strands of a braid, the cause of division being the obstruction by sediment deposited by the stream.

Brush Disposal
Cleanup and disposal of slash and other hazardous fuels within the forest or Project Areas.

Buffer
An area around a resource where timber harvest is restricted or prohibited. For example, the Tongass Timber Reform Act (TTRA) requires that timber harvest be prohibited in an area no less than 100 feet on each side of all Class I streams and Class II streams which flow directly into Class I streams. This 100-foot area is known as a "stream buffer".

Capability
An evaluation of a resource's inherent potential for use.

Channel Migration
Movement of a stream or river channel within a floodplain area usually over an extended period of time.

Clearcut
The harvesting in one cut of all trees on an area. The area harvested may be a patch, strip, or stand large enough to be mapped or recorded as a separate class in planning for sustained yield. Clearcut size on the Tongass National Forest is limited to 100 acres, except for specific conditions noted in the Alaska Regional Guide.

Climax
A community of plants and animals which is relatively stable over time and which represents the late stages of succession under current climate and soil conditions.

Code of Federal Regulations (CFR)
A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

Commercial Forest Land (CFL)
Productive Forest land that is producing or capable of producing crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for management and generally capable of producing in excess of 20 cubic feet per acre of annual growth or in excess of 8,000 board feet net volume per acre. It includes accessible and inaccessible areas.

Normal CFL: Timber that can be economically harvested with locally available logging systems. Composed of two categories:

Standard: Timber that can be economically harvested with locally available logging systems, such as highlead or short-span skyline.

Special: Timber that is in areas where special consideration is needed to protect other resources but can be harvested with locally available logging systems.

Non-standard CFL: Timber that cannot be harvested with locally available logging systems and would require the use of other logging systems such as helicopter or long-span skyline.

Commercial Thinning
Thinning a stand where the trees to be removed are large enough to sell.

Corridor
Connective links of certain types of vegetation between patches of suitable habitat which are necessary for certain species to facilitate movement of individuals between patches of suitable habitat. Also refers to transportation or utility rights-of-way.

Cover
Refers to trees, shrubs, or other landscape features that allow an animal to partly or fully conceal itself.

Critical Habitat
Specific terrain within the geographical area occupied by threatened or endangered species. Physical and biological features that are essential to conservation of the species and which may require special management considerations or protection are found in these areas.

Crown
The tree canopy. The upper part of a tree or woody plant that carries the main branch system and foliage.

Cruise
Refers to the general activity of determining timber volumes and quality as opposed to a specific method.

Cubic Foot (CF)
Equivalent to a cube of wood with 1-foot sides. The cubic foot volume is a measure of the total sound wood in a tree and is a more accurate depiction of wood volume than the board foot measure.

Cull Logs
Trees that do not meet certain quality specifications.
Cultural Resources
Historic or prehistoric objects, sites, buildings, structures, and their remains, resulting from past human activities.
Cumulative Effects
The impacts on the environment resulting from additional incremental impacts of past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions occurring over time.
Cutover
Areas harvested recently.
DBH
Diameter Breast Height. The diameter of a tree measured 4 feet 6 inches from the ground.
Debris Flow
A general term for all types of rapid movement of debris downslope.
Debris Torrents
Landslides that occur as a result of debris; avalanche materials which either dam a channel temporarily or accumulate behind temporary obstructions such as logs and forest debris.
Deer Winter Range
Locations that provide food and shelter for Sitka black-tail deer under moderately severe to severe winter conditions.
Degradation
The general lowering of the surface of the land by erosive processes, especially by the removal of material through erosion and transportation by flowing water.
Developed Recreation
Recreation that requires facilities that, in turn, result in concentrated use of an area. Facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, and buildings.
Direct Employment
The jobs that are immediately associated with the Long-term Contract Timber Sale, including, for example, logging, sawmills, and pulp mills.
Discount Rate
The rate used to adjust future benefits or costs to their present value.
Dissolved Oxygen
The amount of free (not chemically combined) oxygen in water.
Diversity
The distribution and abundance of different plant and animal communities and species within the area controlled by the Forest Plan.
Draft Environmental Impact Statement (Draft EIS)
A statement of environmental effects for a major Federal action which is releasecd to the public and other agencies for comment and review prior to a final management decision. Required by Section 102 of the National Environmental Policy Act (NEPA).
Eagle Nest Tree Buffer Zone
A 330-foot radius around eagle nest trees established in an agreement between the U.S. Fish

and Wildlife Service and the Forest Service.

Ecosystem

A community of organisms and its physical setting. An ecosystem, whether a fallen log or an entire watershed, includes resident organisms, non-living components such as soil nutrients, inputs such as rainfall, and outputs such as organisms that disperse to other ecosystems.

Effects

Effects, impacts, and consequences as used in this environmental impact statement are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, or social, and may be direct, indirect, or cumulative.

Direct Effects: Results of an action occurring when and where the action takes place.

Indirect Effects: Results of an action occurring at a location other than where the action takes place and/or later in time, but in the reasonably foreseeable future.

Cumulative Effects: See Cumulative Effects.

Encumbrance

A claim, lien, charge, or liability attached to and binding real property.

Endangered Species

Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as Endangered in accordance with the 1973 Endangered Species Act. See also Threatened Species, Sensitive Species.

Environmental Analysis (EA)

A comprehensive evaluation of alternative actions and their predictable short-term and long-term environmental effects, which include physical, biological, economic, social, and environmental design factors and their interactions. An EA is less comprehensive than an Environmental Impact Statement (EIS), and may result in a Finding of No Significant Impact; should the EA reveal significant impacts, a full EIS must then be conducted.

Erosion

The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities.

Escapement

Adult anadromous fish that escape from all causes of mortality (natural or human-caused) to return to streams to spawn.

Estuary

For the purpose of this EIS process, estuary refers to the relatively flat, intertidal, and upland areas generally found at the heads of bays and mouths of streams. They are predominately mud and grass flats and are unforested except for scattered spruce or cottonwood.

Even-aged Management

The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of that age of the stand at harvest rotation age. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

Executive Order
An order or regulation issued by the President or some administrative authority under his or her direction.

Existing Visual Condition
The level of visual quality or condition presently occurring on the ground. The six existing visual condition categories are:

Type I: Natural Condition. Areas in which only ecological change has taken place. Corresponds to the Preservation VQO.

Type II: Natural Appearing. Areas in which changes in the landscape are not noticed by the average forest visitor unless pointed out. Corresponds to the Retention VQO.

Type III: Slightly Altered. Areas in which changes in the landscape are noticed, but do not attract attention. Corresponds to the Partial Retention VQO.

Type IV: Moderately Altered. Areas in which changes in the landscape are easily noticed and may attract attention. Corresponds to the Modification VQO.

Type V: Heavily Altered. Areas in which changes in the landscape obviously appear to be major disturbances and stand out as a dominating impression of the landscape. Corresponds to the Maximum Modification VQO.

Type VI: Drastically Altered. Areas in which changes in the landscape are in glaring contrast to a natural appearance. Not a VQO.

Final Environmental Impact Statement (Final EIS)
The final version of the statement of environmental effects required for major Federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the draft environmental impact statement (Draft EIS) to include public and agency responses to the draft. The decision maker chooses which alternative to select from the Final EIS, and subsequently issues a Record of Decision (ROD).

Fiscal Year (FY)
October 1 through September 30, e.g. October 1, 1992 - September 30, 1993 = FY 93.

Floodplain
That portion of a river valley, adjacent to the river channel, which is covered with water when the river overflows its banks at flood stages.

Fluvial
Of or pertaining to streams and rivers.

Foreground
The stand of trees immediately adjacent to a scenic area, recreation facility, or forest highway; area located less than 1/4 mile from the viewer. See also Background and Middleground.

Forest and Rangeland Renewable Resources Planning Act of 1976 (RPA)
Amended in 1976 by the National Forest Management Act. See RPA Assessment and Program.

Forest or Forest Land
National Forest lands currently supporting or capable of supporting forests at a density of 10

percent crown closure or better. Includes all areas with forest cover, including old-growth and second growth, and both commercial and non-commercial forest land.

Forested Wetland

A wetland whose vegetation is characterized by an overstory of trees that are 20 feet or taller.

FSH

Forest Service Handbook.

FSM

Forest Service Manual.

Geographic Information System (GIS)

An information processing technology to input, store, manipulate, analyze, and display spatial and attribute data to support the decision-making process. It is a system of computer maps with corresponding site-specific information that can be electronically combined to provide reports and maps.

Geomorphology

The study of the forms of the land surface and the processes producing them. Also the study of the underlying rocks or parent materials and the landforms present which were formed in geological time.

Groundwater

Water within the earth that supplies wells and springs.

Guideline

A preferred or advisable course of action or level of attainment designed to promote achievement of goals and objectives.

Habitat

The sum total of environmental conditions of a specific place occupied by an organism, population, or community of plants and animals.

Habitat Capability

The number of healthy animals that a habitat can sustain. Used in wildlife models to calculate rough population estimates for management indicator species.

Habitat Improvement

Management of wildlife and fish habitat to increase their capability.

Hard Snags/Soft Snags

Hard snags are dead trees which have little decay and are generally still hard wood. Soft snags are dead trees which have a considerable amount of decay and are generally soft, broken wood.

IMPLAN

A computer-based system used by the Forest Service for constructing nonsurvey input/output models to measure economic input. The system includes a database for all counties in the United States and a set of computer programs to retrieve data and perform the computational tasks for input/output analysis.

Indirect Employment

The jobs in service industries that are associated with the Long-term Contract timber sale including, for example, suppliers of logging and milling equipment.

Inoperable Timber

Timber that cannot be harvested by any proven method because of potential resource dam-

age, extremely adverse economic considerations, or physical limitations.

Interdisciplinary Team (IDT)
A group of people with different backgrounds assembled to research, analyze, and write a project Environmental Impact Statement. The team is assembled out of recognition that no one scientific discipline is sufficiently broad enough to adequately analyze a proposed action and its alternatives.

Issue
A point, matter, or section of public discussion or interest to be addressed or decided.

Knutsen-Vandenburg Fund (KV)
The portion of timber sale receipts collected and used for reforestation and other renewable resource projects on the sale area.

Land Allocation
The decision to use land for various resource management objectives to best satisfy the issues, concerns and opportunities and meet assigned forest output targets.

Land Use Designation
A defined area of land specific to which management direction is applied in the Forest Plan.

Land Use Prescriptions
Specific management direction applied to a defined area of land to attain multiple use and other goals and objectives.

Landslides
The moderately rapid to rapid down slope movement of soil and rock materials that may or may not be water-saturated.

Large Woody Debris
Any large piece of relatively stable woody material having a diameter of at least 4 inches and a length greater than 3 feet that intrudes into the stream channel. Also called Large Organic Debris (LOD).

Log Transfer Facility (LTF)
A facility that is used for transferring commercially-harvested logs to and from a vessel or log raft, or the formation of a log raft. It is wholly or partially constructed in waters of the United States and location and construction are regulated by the 1987 Amendments to the Clean Water Act. Formerly termed "terminal transfer facility" or "log dump".

Logging Systems

Highlead: A cable yarding system, using a two-drum yarder, in which lead blocks are hung on a spar or tower to provide lift to the front end of the logs. Grabinski is a modified highlead cable system.

Aerial Logging Systems: Systems where the cut logs are moved from the stump to the loading area or log deck without touching the ground.

Live skyline/gravity carriage return: A two-drum, live skyline yarding system in which the carriage moves down the skyline by gravity; thus, is restricted to uphill yarding; the skyline is lowered to attach logs, then raised and pulled to the landing by the mainline.

Live skyline/haulback required: A live skyline yarding system composed of skyline, mainline, and haulback; the carriage is pulled to the woods by the haulback; the sky-

line is lowered to permit the chokers to be attached to the carriage, and the turn is brought to the landing by the mainline.

Running skyline: A yarding system with three suspended moving lines, generally referred to as the main, haulback, and slack-pulling, that when properly tensioned will provide lift, travel, and control to the carriage; normally indicates a gantry type tower and a three-drum yarder.

Standing skyline: Used wherever yarding distances or span distances exceed the capability of live skyline equipment.

Multispan skyline: European equipment is commonly associated with this.

Tractor: Used to describe the full range of surface skidding equipment, designed to operate on level to downhill settings.

Shovel: A system of short-distance logging in which logs are moved from the stump to the landing by repeated swinging with a swing-boom log loader; the loader is walked off the haul road and out into the harvest unit; logs are moved and decked progressively closer to the haul road with each pass of the loader; when logs are finally decked at roadside, the same loader, or a different loader, loads out trucks. On gentle ground, logs are either heeled and swung or dragged by the boom as it rotates; larger log length and tree-length logs are usually dragged to maintain machine stability. Soils should be moderate to well drained and side slopes must be less than 20 percent; passes or stripes should be kept to a maximum of four.

Helicopter: Flight path cannot exceed 40 percent downhill or 30 percent uphill; landings must be selected so there is adequate room for the operation and so that the helicopter can make an upwind approach to the drop zone.

A-frame: Beach fringe timber which is logged with a float-mounted yarder typically rigged in a highlead configuration for direct A-frame yarding.

Cold-deck and swing: Planned to access areas not suitable for skyline operations.

MBF
A thousand board feet net sawlog and utility volume.

MMBF
A million board feet net sawlog and utility volume.

MMCF
A million cubic feet net sawlog and utility volume.

Management Indicator Species (MIS)
Species selected in a planning process that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.

Management Prescriptions
Method of classifying land uses presented in the 1997 Tongass Land and Resource Management Plan (TLRMP (modified 1999)). Replaces the land use designations originally

presented in the Forest Plan.

Management Requirement

Standards for resource protection, vegetation manipulation, silvicultural practices, even-aged management, riparian areas, and soil and water and diversity, to be met in accomplishing National Forest System goals and objectives (see 36 CFR 219.17).

Mass Failure

The downslope movement of a block or mass of soil. This usually occurs under conditions of high soil moisture and does not include individual soil particles displaced as surface erosion.

Maritime Climate

Weather conditions controlled by an oceanic environment characterized by small annual temperature ranges and high precipitation.

McGilvery (Soil series)

Soil series which represents the only well-drained organic soil found in the Ketchikan Area. It is composed of a thin surface layer (less than 8 inches deep) of organic material overlying bedrock. These soils are associated with cliffs and rock outcrops, and are sensitive to disturbance.

Memorandum of Understanding (MOU)

A legal agreement between the Forest Service and other agencies resulting from consultation between agencies that states specific measures the agencies will follow to accomplish a large or complex project. A memorandum of understanding is not a fund obligating document.

Microclimate

The temperature, moisture, wind, pressure, and evaporation (climate) of a very small area that differs from the general climate of the larger surrounding area.

Middleground

The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly for the landscape; area located from 1/4 to 5 miles from the viewer. See also Foreground and Background.

Mineral Soils

Soils consisting predominately of, and having its properties determined by, mineral material.

Minimum Viable Population

A population with the estimated numbers and distribution of reproductive individuals to maintain the population over time.

Mining Claims

A geographic area of the public lands held under the general mining laws in which the right of exclusive possession is vested in the locator of a valuable mineral deposit.

Mitigation

Measures designed to counteract environmental impacts or to make impacts less severe. These may include: avoiding an impact by not taking a certain action or part of an action; minimizing an impact by limiting the degree or magnitude of an action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources or environments.

Mixed Conifer
In Southeast Alaska, mixed conifer stands usually consist of western hemlock, mountain hemlock, Alaska yellowcedar, Western redcedar, and Sitka spruce species. Shore pine may occasionally be present depending on individual sites.

Model
A representation of reality used to describe, analyze, or understand a particular concept. A model may be a relatively simple qualitative description of a system or organization, or a highly abstract set of mathematical equations. A model has limits to its effectiveness, and is used as one of several tools to analyze a problem.

Monitoring
A process of collecting information to evaluate whether or not objectives of a project and its mitigation plan are being realized. Monitoring can occur at different levels: to confirm whether mitigation measures were carried out in the manner called for, to determine whether the mitigation measures were effective, or to validate whether overall goals and objectives were appropriate. Different levels call for different methods of monitoring.

Multiple-aged Stands
An intermediate form of stand structure between even and uneven-aged stands. These stands generally have two or three distinct tree canopy levels occurring within a single stand.

Multiple Use
The management of all the various renewable resources of the National Forest System to be used in the combination that will best met the needs of the American people.

Muskeg
In Southeast Alaska, a type of bog that has developed over thousands of years in depressions or flat areas on gentle to steep slopes. Also called peatlands.

National Environmental Policy Act (NEPA) of 1969
An Act to declare a national policy which will encourage productive and enjoyable harmony between humankind and the environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the Nation, and to establish a Council on Environmental Quality (The Principal Laws Relating to Forest Service Activities, Agricultural Handbook 453. USDA Forest Service, 359 pp.).

National Forest Management Act (NFMA)
A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act requiring the preparation of Regional Guides and Forest Plans and the preparation of regulations to guide that development.

National Wild and Scenic River System
Rivers with outstanding scenic, recreational, geological, fish and wildlife, historic, cultural, or other similar values designated by Congress under the Wild and Scenic Rivers Act of 1968 and amended in 1986, for preservation of their free-flowing condition. May be classified and administered under one or more of the following categories: Wild, Scenic, and/or Recreational.

Native Selection
Application by Native corporations and individuals to a portion of the USDI Bureau of Land Management for conveyance of lands withdrawn in fulfillment of Native entitlements established under ANSCA.

Net Sawlog Volume
Tree or log volume suitable in size and quality to be processed into lumber. In Southeast Alaska, depending on the market, the volume may be processed as pulp or lumber.

No-action Alternative
The most likely condition expected to exist in the future if current management direction were to continue unchanged.

Non-commercial Forest Land
Land with more than 10 percent cover of commercial tree species but not qualifying as Commercial Forest Land.

Non-commercial species
Species that have no economic values at this time nor anticipated timber value within the near future.

Non-Forest Land
Land that has never supported forests and lands formerly forested but now developed for such nonforest uses as crops, improved pasture, etc.

Notice of Intent (NOI)
A notice printed in the Federal Register announcing that an Environmental Impact Statement will be prepared. The NOI must describe the proposed action and possible alternatives, describe the agency's proposed scoping process, and provide a contact person for further information.

Objectives
The precise steps to be taken and the resources to be used in achieving goals.

Offering
A Forest Service specification of timber harvest units, subdivisions, roads, and other facilities and operations to meet the requirements of a contract.

Offering Area
A geographic area identified by the Forest Service within which the offering specifications are outlined. One or more offering areas may be identified within all or a portion of a project area.

Old-Growth
Ecosystems distinguished by old trees and related structural attributes. Old-growth encompasses the later stages of forest stand development that typically differ from earlier stages in a variety of characteristics which may include larger tree size, higher composition, and different ecosystem function. The structure and function of an old-growth ecosystem will be influenced by its stand size and landscape position and context.

Organic Soils
Soils that contain a high percentage (generally greater than 20 to 30 percent) of organic matter throughout the soil depth.

Parent Material
The unconsolidated and partially-weathered material (or the C Horizon) from which upper layers of soil developed.

Partial Cut
Method of harvesting trees where any number of live stems are left standing in any of various spatial patterns. This does not include clearcutting. Can include seed tree, shelterwood, or other methods.

Patch
A non-linear surface area differing in appearance from its surroundings.
Payments to States
A fund consisting of approximately 25 percent of the gross annual timber receipts received by the National Forests in that State. This is returned to the State for use on roads and schools.
Peak flow
The highest discharge of water recorded over a specified period of time at a given stream location. Often thought of in terms of spring snowmelt, summer, fall, or winter rainy season flows. Also called maximum flow.
Planning Area
The area of the National Forest System controlled by a decision document.
Planning Record
A system that records decisions and activities that result from the process of developing a forest plan, revision, or significant amendment.
Plant Association
Climax plant community type.
Plant Communities
Aggregations of living plants having mutual relationships among themselves and to their environment. More than one individual plant community.
Pole
An immature tree between 5 and 9 inches diameter breast height.
Population Viability
Ability of a population to sustain itself.
Present Net Value (PNV)
The difference between the benefits and costs associated with the alternatives.
Primary Stream Production
Results from photosynthesis by green plants. In streams, includes production from algae and aquatic plants, and from non-stream sources such as leaf litter.
Process Group
A combination of similar channel types based on major differences in landform, gradient, and channel shapes.
Public Participation
Meetings, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities designed and held to obtain comments from the public about Forest Service activities.
Receipts
Those priced benefits for which money will actually be paid to the Forest Service: recreation fees, timber harvest, mineral leases, and special use fees.
Record of Decision
A document separate from but associated with an Environmental Impact Statement which states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not.

Reforestation
The natural or artificial restocking of an area with trees.

Regeneration
The process of establishing a new crop of trees on previously-harvested land.

Regional Forester
The Forest Service official responsible for administering a single region.

Regional Guide
The guide developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974 as amended. It guides all natural resource management activities and establishes management standards and guidelines for the National Forest System lands within a given region.

Rehabilitation
Actions taken to protect or enhance site productivity, water quality, or other values for a short period of time.

Resident Fish
Fish that are not anadromous and that reside in freshwater on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat trout.

Resource values
The tangible and intangible worth of forest resources.

Responsible Official
The Forest Service employee who has the delegated authority to make a specific decision.

Restoration
The long-term placement of land back into its natural condition or state of productivity.

Revegetation
The re-establishment and development of a plant cover. This may take place naturally through the reproductive processes of the existing flora or artificially through the direct action of reforestation or reseeding.

Riparian Area
Area with distinctive resource values and characteristics that contain elements of aquatic and riparian ecosystems, which can be geographically delineated.

Riparian Ecosystem
Land next to water where plants that are dependent on a perpetual source of water occur.

Roads

Arterial: Roads usually developed and operated for long-term land and resource management purposes to constant service.

Collector: Collects traffic from Forest local roads; usually connects to a Forest arterial or public highway.

Local: Provides access for a specific resource use activity such as a timber sale or recreational site, although other minor uses may be served.

Pre-planned: Roads planned in a prior EIS.

Temporary: For National Forest timber sales, temporary roads are constructed to harvest timber on a one-time basis. These logging roads are not considered part of the

permanent Forest transportation network and have stream crossing structures removed, erosion measures put into place, and the road closed to vehicular traffic after harvest is completed.

Roadless Area
An area of undeveloped public land within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.

Rotation
The planned number of years (approximately 100 years in Alaska) between the time that a forest stand is regenerated and its next cutting at a specified stage of maturity.

Rotation Age
The age of a stand when harvested at the end of a rotation.

RPA Assessment and Program
The RPA Assessment is prepared every 10 years and describes the potential of the nation's forests and rangelands to provide a sustained flow of goods and services. The RPA Program is prepared every 5 years to chart the long-term course of Forest Service management of the National Forests, assistance to State and private landowners, and research. They are prepared in response to Sections 3 and 4 of the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) (16 U.S.C. 1601).

Sawlog
That portion of a tree that is suitable in size and quality for the production of dimension lumber collectively known as sawtimber.

Scheduled Lands
Land suitable and scheduled for timber production and which are in the land base for the calculation of the allowable sale quantity and long-term sustained yield timber capacity.

Scheduled Timber Harvests
Timber harvests done as part of meeting the allowable sale quality.

Scoping Process
Early and open activities used to determine the scope and significance of a proposed action, what level of analysis is required, what data is needed, and what level of public participation is appropriate. Scoping focuses on the issues surrounding the proposed action, and the range of actions, alternatives, and impacts to considered in an EA or an EIS.

Scrub-Shrub Wetland
Wetlands dominated by woody vegetation less than 20 feet tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. In Southeast Alaska this includes forested lands where trees are stunted because of poor soil drainage.

Second Growth
Forest growth that has become established following some disturbance such as cutting, serious fire, or insect attack; even-aged stands that will grow back on a site after removal of the previous timber stand.

Sediment
Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface.

Seed Tree
Small number of seed-bearing trees left singly or in small groups after timber harvest to provide seed for regeneration of the site.

Selective Cutting
The annual or periodic removal of trees (particularly the mature), individually or in small groups from an uneven-aged forest to achieve the balance among diameter classes needed for sustained yields, and in order to realize the yield, and establish a new crop of irregular constitution. Note: The improvement of the forest is a primary consideration.

Sensitive Species
Plant and animal species which are susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on a non-official State list, or that are recognized by the Regional Forester as needing special management to prevent placement on Federal or State lists.

Sensitivity Level
A map inventory that measures peoples' concern for the scenic quality of the National Forests. In 1980, the Tongass National Forest assigned sensitivity levels to land areas viewed from anchorages, plane and boat routes, roads, trails, public-use areas, and recreation cabins.

Level I: Includes all seen areas from primary travel routes, use areas, and water bodies where at least three-fourths of the Forest visitors have a major concern for scenic quality.

Level II: Includes all seen areas from primary travel routes, use areas, and water bodies where at least one-fourth of the Forest visitors have a major concern for scenic quality.

Level III: Includes all seen areas form secondary travel routes, use areas, and water bodies where less than one-fourth of the Forest visitors have a major concern for scenic quality.

Shelterwood Cutting
A harvest method in which most of the trees are removed in an initial entry and some trees are left to naturally reseed the area and provide protection to new seedlings that establish on the site. A second entry is conducted later to remove the remaining trees.

Silviculture
The science of controlling the establishment, composition, and growth of forests.

Single-tree Selection
A cutting method to develop and maintain uneven-aged stands by removal of selected trees from specified age classes over the entire stand area in order to meet a predetermined goal of age distribution and species in the remaining stand.

Site Index
A measure of the relative productive capacity of an area for growing wood. Measurement of site index is based on height of the dominant trees in a stand at a given age.

Site Preparation
Manipulation of the vegetation or soil of an area prior to planting or seeding. The manipula-

tion follows harvest, wildfire, or construction in order to encourage the growth of favored species. Site preparation may include the application of herbicides, burning, or cutting of living vegetation that competes with the favored species; tilling the soil; or burning of organic debris (usually logging slash) that makes planting or seeding difficult.

Site Productivity
Production capability of specific areas of land.

Slope Distance
Distance measured along the contour of the ground.

Smolt
Young silvery-colored salmon or trout which move from freshwater streams to saltwater.

Snag
A standing dead tree, usually greater than 5 feet tall and 6 inches in diameter at breast height.

Soil Productivity
The capacity of a soil, in its normal environment, to produce a specific plant or sequence of plants under a specific system of management.

Soil Quality Standards
Standards that are a combination of 1) "threshold" values for severity of soil property alteration, or significant change in soil properties conditions, and 2) a real extent of disturbance.

Special Habitats
Structural elements of ecosystems. These may include, but are not limited to: snags, spawning gravels, fallen trees, aquatic reefs, caves, seeps, and springs.

Split Yarding
The process of separating the direction of timber harvest yarding into opposite directions.

Stand (Tree Stand)
An aggregation of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition as to be distinguishable from the forest in adjoining areas.

Standard
A course of action or level of attainment required by the Forest Plan to promote achievement of goals and objectives.

State Historic Preservation Officer (SHPO)
State-appointed official who administers Federal and State programs for cultural resources.

Stocking
The degree of occupancy of land by trees as measured by basal area or number of trees and as compared to a stocking standard; that is, the basal area or number of trees required to fully use the growth potential of the land.

Stream Classes
See Aquatic Habitat Management Unit.

Stream Order
First-order streams are the smallest unbranched tributaries; second-order streams are initiated by the point where two first-order streams meet; third-order streams are initiated by the point where two second-order streams meet, and so on.

Structural Diversity
The diversity of forest structure, both vertically and horizontally, which provides for a variety of forest habitats such as logs and multi-layered forest canopy for plants and animals.

Stumpage
The value of timber as it stands uncut in terms of dollar value per thousand board feet.
Subsistence
Section 803 of the Alaska National Interest Lands Conservation Act defines subsistence use as, "the customary and traditional uses by rural Alaska residents of wild renewable resources for direct, personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible by-products of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade."
Subsistence Use Area
Important Subsistence Use Areas include the "most reliable" and "most often hunted" categories from the Tongass Resource Use Cooperative Survey (TRUCS) and from subsistence survey data from ADF&G, the University of Alaska, and the Forest Service, Region 10. Important use areas include both intensive and extensive use areas for subsistence harvest of deer, furbearers, and salmon.
Substantive Comment
A comment that provides factual information, professional opinion, or informed judgement germane to the action being proposed.
Substrate
The type of material in the bed (bottom) of rivers and streams.
Succession
The ecological progression of community change over time, characterized by displacements of species leading towards a stable climax community.
Suitable
Commercial forest land identified as having both the biological capability and availability to produce industrial wood products.
Suitable Forest Land
Forest land for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions, and for which there is reasonable assurance that such lands can be adequately restocked, and for which there is management direction that indicated that timber production is an appropriate use of that area.
Suspended Sediment
The very fine soil particles which remain in suspension in water for a considerable period of time without contact with the stream or river channel bottom.
Sustained Yield
The amount of renewable resources that can be produced continuously at a given intensity of management.
TLRMP
See Tongass Land and Resource Management Plan.
Tentatively Suitable Forest Land
Forest land that is producing or is capable of producing crops of industrial wood and: (a) has not been withdrawn by Congress, the Secretary of Agriculture or the Chief of the Forest Service; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils productivity, or watershed conditions; (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable

assurance that it is possible to restock adequately within 5 years after final harvest; and (d) adequate information is available to project responses to timber management activities.

Thinning

The practice of removing some of the trees in a stand so that the remaining trees will grow faster due to reduced competition for nutrients, water, and sunlight. Thinning may also be done to change the characteristics of a stand or wildlife or other purposes. Thinning may be done at two different stages.

Threatened Species

Plant or animal species which is likely to become endangered throughout all or a significant portion of its range within the foreseeable future, as defined in the Endangered Species Act of 1973, and which has been designated in the Federal Register by the Secretary of the Interior as a Threatened Species. See also Endangered Species, Sensitive Species.

Threshold

The point or level of activity beyond which an undesirable set of responses begins to take place within a given resource system.

Tiering

Eliminating repetitive discussions of the same issue by incorporating by reference. The general discussion in an environmental impact statement of broader scope; e.g., this document is tiered to the Tongass Land and Resource Management Plan, as amended.

Timber Appraisal

Establishing the fair market value of timber by taking the selling value minus manufacturing costs, the cost of getting logs from the stump to the manufacturer, and an allowance for profit and risk.

Timber Classification

Forested land is classified under each of the land management alternatives according to how it relates to be management of the timber resource. The following are definitions of timber classifications used for this purpose.

Nonforest: Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.

Forest: Land at least 10 percent stocked (based on crown cover) by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.

Suitable or suitable available: Land to be managed for timber production on a regulated basis.

Unsuitable: Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness), or identified as inappropriate for timber production in the Forest planning process.

Commercial forest: Forest land tentatively suitable for the production of continuous crops of timber and that has not been withdrawn.

Timber Harvest Unit

A "Timber Harvest Unit" is a portion of a timber sale within which Forest Service specifies for harvest all or part of the timber to meet the requirements of a timber sale contract.

Timber Stand Improvement (TSI)
All noncommercial intermediate cutting and other treatments to improve composition, condition, and volume growth of a timber stand.

Tongass Land and Resource Management Plan (Forest Plan)
The 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning, the daily uses, and the activities carried out within the forest.

Turbidity
An indicator of the amount of sediment suspended in water.

Understory
The trees and shrubs in a forest growing under the canopy or overstory.

Uneven-aged Management
Forest management techniques which simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and the orderly growth and development of trees through a range of diameter or age classes. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes.

Unscheduled Lands
Lands suitable but not scheduled for timber production and which are not in the land base for the calculation of the allowable sale quantity nor long-term sustained yield timber capacity.

Unsuitable
Forest land withdrawn from timber utilization by statute or administrative regulation; for example, Wilderness, or identified as not appropriate for timber production in the forest planning process.

Utility Logs
Those logs that do not meet sawlog grade but are suitable for production of firm usable pulp chips.

VAC
See Visual Absorption Capability.

Value Comparison Unit (VCU)
Areas which generally encompass a drainage basin containing one or more large stream systems; boundaries usually follow easily recognizable watershed divides. Established to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

Viable Population
The number of individuals of a species required to ensure the long-term existence of the species in natural, self-sustaining populations adequately distributed throughout their region.

Viewshed
An expansive landscape or panoramic vista seen from a road, marine waterway, or specific viewpoint.

Visual Quality Objectives (VQO)
Measurable standards reflecting five different degrees of landscape alteration based upon a landscape's diversity of natural features and the public's concern for high scenic quality. The five categories of VQOs are:

Preservation: Permits ecological changes only. Applies to Wilderness areas and other

special classified areas. Management activities are generally not allowed in this setting.

Retention: Provides for management activities that are not visually evident to the casual forest visitor.

Partial Retention: Management activities remain visually subordinate to the natural landscape.

Modification: Management activities may visually dominate the characteristics landscape. However, activities must borrow from naturally-established form-line color and texture so that the visual characteristics resemble natural occurrences within the surrounding area when viewed in the middleground distance.

Maximum Modification: Management activities may dominate the landscape but should appear as a natural occurrence when viewed as background.

V-Notches
A deeply incised valley along some waterways that would look like a "V" from a cross-section. These abrupt changes in terrain features are often used as harvest unit or yarding boundaries.

Volume
Stand volume based on standing net board feet per acre by Scribner Rule.

Volume Class
Used to describe the average volume of timber per acre in thousands of board feet (MBF). The seven volume classes include:

Classes 1 to 3: Less than 8 MBF/acre (cleared land, seedlings, or pole timber stands).

Class 4: 8 to 20 MBF/acre.

Class 5: 20 to 30 MBF/acre.

Class 6: 30 to 50 MBF/acre.

Class 7: 50+ MBF/acre.

Watershed
The area that contributes water to a drainage or stream. Portion of the forest in which all surface water drains to a common point. Watersheds can range from a few tens of acres that drain a single small intermittent stream to many thousands of acres for a stream that drains hundreds of connected intermittent and perennial streams.

Wetland
Areas that are inundated by surface or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include: swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds. See the Forest Plan pp. 3-318 and 3-321 for detailed discussion on wetland type definitions.

Wilderness
Areas designated by congressional action under the 1964 Wilderness Act. Wilderness is

defined as undeveloped Federal land retaining its primeval character and influence without permanent improvements or human habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or a primitive and unconfined type of recreation; areas of at least 5,000 acres are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest. In Alaska, Wilderness has been designated by ANILCA and TTRA.

Wildlife Analysis Area (WAA)

A division of land used by the Alaska Department of Fish and Game for wildlife analysis.

Wildlife Habitat

The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

Windfirm

Trees that have been exposed to the wind throughout their life and have developed a strong root system or trees that are protected from the wind by terrain features.

Windthrow

The act of trees being uprooted by the wind. In Southeast Alaska, Sitka spruce and hemlock trees are shallow rooted and susceptible to windthrow. There generally are three types of windthrow:

Endemic: where individual trees are blown over;

Catastrophic: where a major windstorm can destroy hundreds of acres; and

Management Related: where the clearing of trees in an area make the adjacent standing trees vulnerable to windthrow.

Winter Range

An area, usually at lower elevation, used by big game during the winter months; usually smaller and better-defined than summer ranges.

Yarding

Hauling timber from the stump to a collection point.

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Appendix A

Reasons for Scheduling the Environmental Analysis of Emerald Bay Timber Sale

Appendix A

Reasons for Scheduling the Environmental Analysis of Emerald Bay Timber Sale

This Appendix provides a detailed explanation of the rationale for a specific timber sale project and its importance to the multi-year timber program on the Tongass National Forest. To accomplish this, the following questions are answered:

- **Why is Timber from the Tongass National Forest Being Offered for Sale?**
- **What Steps Must Be Completed to Prepare a Sale for Offer?**
- **How does the Forest Service Develop Expectations about the Market Demand for Timber?**
- **How does the Forest Service Maintain an Orderly and Predictable Timber Sale Program?**
- **How Does the Forest Service Decide Where Timber Sale Projects Should be Located?**
- **How Does This Project Fit into the Tongass Timber Program?**
- **Why Can't This Project Be Located Somewhere Else?**

Coordinated timber sale planning is essential for meeting the goals of the Tongass Land Management Plan and to provide an orderly flow of timber to local industry. To determine the volume of timber to offer each year, the Forest Service can look to current market conditions and the level of industry operations. However, the lengthy planning process—of which this document is a part—requires the Forest Service to rely on projections of future harvest levels to decide how many timber sale projects to begin each year. This document explains how the Forest Service uses information about future markets and past experience with the logistics of timber sale planning to determine the volume of timber that needs to be started through this process each year. Using a detailed timber sale schedule that provides information about each sale as it moves through each stage of the planning process, this Appendix explains the rationale and the necessity for completing this particular timber sale project at this point in time.

A Appendix

Why is Timber from the Tongass National Forest Being Offered for Sale?

National Legislation

On a national level, the legislative record is very clear about the role of the timber program in the multiple-use mandate of the National Forests. The Organic Act of 1897, 16 USC 473-481 (partially repealed in 1976) directed the agency to manage the forests in order to "improve and protect the forest ... [and] for the purpose of securing favorable conditions of water flows, and to *furnish a continuous supply of timber* for the use and necessities of the citizens of the United States" (emphasis added.) The Multiple-Use Sustained Yield Act of 1960, 16 U.S.C. 528-531, directs the Forest Service to administer federal lands for "outdoor recreation, range, timber, watershed, and wildlife and fish purposes."

The National Forest Management Act of 1976 (16 U.S.C. 472a) states that "the Secretary of Agriculture...[may sell, at not less than appraised value, trees, portions of trees, or forest products located on National Forest System Lands." Although the heart of the Act is land management planning, the Act also sets policy direction for timber management and public participation in Forest Service decision making. Under NFMA, the Forest Service was directed to "limit the sale of timber from each national forest to a quantity equal to or less than a quantity which can be removed from such forest annually in perpetuity on a sustained-yield basis" (16 U.S.C. 1611)

The NFMA directed the Forest Service to complete land management plans for all units of the National Forest System. Forest Plans were to be developed by an interdisciplinary team to provide for the coordination of outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness. The 1979 Tongass National Forest Land and Resource Management Plan was the first to be completed. A revised Forest Plan was issued in 1997. With regard to timber production, the Record of Decision for the 1997 Plan stated:

> The Tongass National Forest will continue to allow timber harvest while maintaining sustained yield and multiple use goals…Although the maximum amount of timber that could be harvested during the first decade of the Revised Plan implementation is an average of 267 MMBF per year, a level of 200 MMBF or less is more likely to be offered over the next few years, given current market conditions and the transition that both the timber industry and the Forest Service is experiencing. Therefore the public can expect the amount of timber to be offered annually to vary between 200 MMBF or less and 267 MMBF.
>
> …The timber resource will be managed for production of sawtimber and other wood products from timberlands available for sustainable timber harvest, on an even-flow, sustained-yield basis and in an economically efficient manner. We will seek to provide a timber supply sufficient to meet the annual market demand for Tongass National Forest timber and the market demand for the planning cycle…

In April 1999, Under Secretary Jim Lyons elected to modify the 1997 Plan and issue a new Record of Decision (ROD). As stated in the 1999 ROD:

> The Tongass National Forest will continue timber harvest consistent with sustained yield and multiple use goals. The forest-wide standards and guidelines for timber

> include general direction to "[e]nsure that silvicultural systems other than clearcutting are considered through an appropriate project level analysis process. However, uneven-aged management systems will be limited to areas where yarding equipment suited to selective logging can be used"...
>
> Forest-wide, considering all land allocations where timber harvest is permitted, it is estimated that 65 percent of harvesting will involve clearcutting, with the remaining 35 percent utilizing other methods.
>
> ...the ASQ for the next 10 years on the Tongass is reduced from an estimated average annual level of 267 MMBF in the 1997 ROD to 187 MMBF in the 1999 ROD, considering both NIC I and NIC II. Although initially this would seem to be a significant reduction in the ASQ, this ceiling for timber harvests from the Tongass remains sufficient to meet all but the most optimistic projections for timber demand and harvests from the Forest for the next decade. I believe that the additional environmental and multiple use benefits provided by this decision should not result in negative social and economic impacts based upon the most current demand for timber.

In day to day operation of the Tongass timber program, the Forest Service attempts to strike a balance among timber availability as documented in the Forest Plan, the market demand for timber in Southeast Alaska, the needs and desires of other forest users, and funding allocations made by Congress.

Alaska-Specific Legislation

Legislation unique to Alaska also directs the Forest Service to maintain a commercial timber program. The Alaska National Interest Lands Conservation Act (ANILCA; P.L. 96-487, 1980) and the Tongass Timber Reform Act (TTRA; P.L. 101-625, 1990) speak directly to the issue of Tongass timber supply.
Section 705(a) of ANILCA directed the Forest Service to maintain a timber supply from the Tongass at a rate of four billion five hundred million board feet per decade. To ensure that the timber target was met, Congress provided for a $40 million annual earmark to fund preroading, cultural treatments and innovated logging systems.

Section 101 of TTRA repealed the timber supply mandate and fixed appropriations of ANILCA and replaced them with the following more general direction:

> Sec. 705. (a), Subject to appropriations, other applicable law, and the requirements of the National Forest Management Act (P.L. 94-588); except as provided in subsection 9d) of this section, the Secretary shall, to the extent consistent with providing for the multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the annual market demand from such forest for each planning cycle.

Timber from the Tongass National Forest is being offered as part of the multiple use mission of the Forest Service as identified in public laws. Alaska-specific legislation and the Forest Plan directs the Forest Service to seek to provide timber to meet market demand subject to appropriations and balancing of forest uses.

What Steps Must Be Completed to Prepare a Sale for Offer?

The timber sale program is complex. A number of projects are underway at any given point in time, each of which may be in a different stage of planning and preparation. A system of checkpoints, or "gates", helps the Forest Service track the significant milestones of each project from inception to contract termination, followed by monitoring, reforestation, and timber stand improvement. Each project passes through all of the following gates, with the complexity of the sale determining the complexity of the final product at each stage.

Gate 1: Completion of Position Statement. The Position Statement is a brief analysis of the project area with the intent of determining the feasibility of the potential timber sale. This is the first step in the timber sale planning process and it is usually completed from seven to ten years before a sale is offered. After the Position Statement is developed, the Forest Service decides whether to continue to the next phase of the project where a significant investment in time and money will be made.

Gate 2: Sale Area Design, Environmental Documentation and Decision. This phase of the project is commonly referred to as the "NEPA" phase and includes inventory, public scoping, analysis, draft disclosure of the effects of the project on the environment, public comment, final analysis and disclosure, decision, potential appeal, and litigation. Gate 2 activities are generally completed two to six years before a sale is offered. The end product of this phase, an environmental decision document, forms the starting point for the next phase.

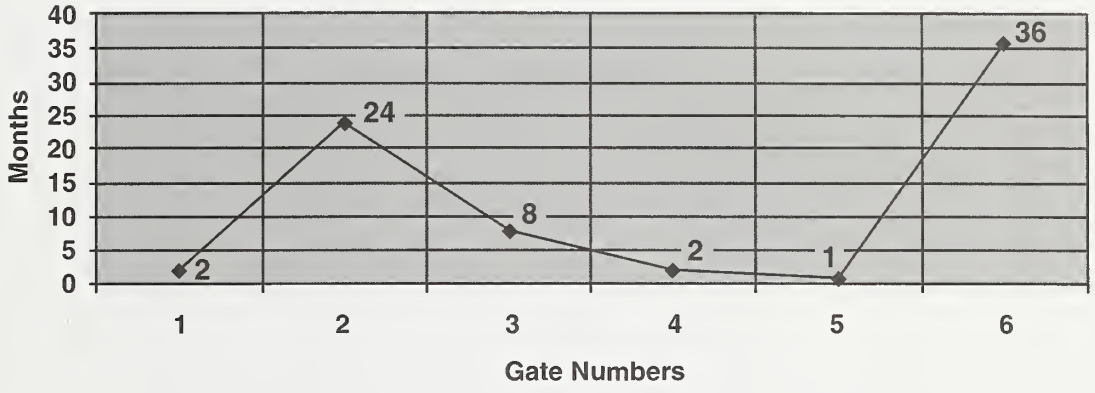
Gate 3: Plan Implementation and Field Layout. Gate 3 activities are typically completed one to three years before a sale is offered. During this phase, the information and direction included in the decision document (Gate 2) is used to designate the actual project on the ground. Additional site-specific information is collected at this time.

Gate 4: Appraisal Offering Package. The costs and value associated with the timber sale designed in Gate 3 are computed and packaged in a timber sale contract. The contract tells the prospective timber sale purchaser how the sale must be harvested to be in conformance to the project decision document. This phase of the Gate system occurs during the final year of the project development and culminates with the advertisement of the project for sale.

Gate 5: Bid Opening. Gate 5 is completed with the opening of bids for the project. If a bid is submitted, contractual provisions govern when the award of the sale takes place and when the sale will be completed and how timber removal is to occur.

Gate 6: Award. Gate 6 is the formal designation of a contract between a bidder and the Forest Service.

Figure A-1 Average Timeline for the Gate System



How Does the Forest Service Develop Expectations about Future Timber Markets?

The Tongass National Forest makes two determinations on volume to be offered. The first is a determination on volume to be offered for the current year (annual market demand). The annual market demand is analogous to assessing industry performance in the short-term. In the short-run a firm will make use of its existing equipment to maximize profits or minimize losses. The general approach is to consider the timber requirements of the region's sawmills at different levels of operation and under different assumptions about market conditions and technical processing capability. These assumptions provide a basis for estimating the volume of timber likely to be processed by the industry as a whole in any given year. Timber inventory requirements are acknowledged and estimated in a related calculation. The volume of timber likely to be purchased is equal to the volume needed to make up any inventory shortfall in addition to the volume likely to be harvested in the coming year. The document titled *Evaluating the Demand for Tongass Timber* (USDA, Forest Service, R-10; Morse; September 28, 1998) forms the basis for how these estimates are developed. The document titled *Tongass Timber Sale Procedures* (USDA, Forest Service, R-10; Morse, Draft August 30, 1999) documents actual estimates for the current year. This estimate is what the Tongass plans to offer for the current year of the Ten Year Timber Sale Schedule pending sufficient funding to do so.

Based on the analysis documented in *Tongass Timber Sale Procedures*, for Fiscal Year 2000, the Tongass National Forest plans to offer approximately 148 MMBF for sale. The sales planned for offer will be a combination of new, previously offered, or previously offered and reconfigured. Both standing timber and salvage will be components of the program. Offerings will consist of those targeted for Small Business qualified firms as well as a portion of the volume being made available for the open market.

Life of the Forest Plan (Market Demand over the Planning Cycle)

Given the long time involved in preparing a timber sale, the proposed timber sales in this document may not be harvested for 3 to 4 years or longer, not including appeals or litigation. The Forest Service needs some idea of what the long run timber demand will be given cycles in the market. On average what should the Forest Service plan for offer, given that timber from this NEPA document may not be harvested for 4 years into the future? The Forest Service needs to take a long-run view for planning purposes. To answer these questions the Forest Service asked the Pacific Northwest Research Station for professional assistance.

As the Tongass Land Management Plan was being revised in 1997, research economists at the Pacific Northwest Research Station (PNW) were asked to update their earlier projections of Alaska timber products output and timber harvest by ownership. The most recent projections of timber harvest over the planning cycle account for several dramatic changes in the region's manufacturing capabilities, increased competition from a number of sources, and the steady erosion of North America's share of Japanese timber markets.

The Tongass documents these projections and the means of implementation through the issuance of a Ten Year Timber Sale Schedule. Each year this plan is updated whereby the current year is dropped at the culmination of the fiscal year and a new year ten is added. The basis for this schedule is long range timber market projections documented in the publication titled *Timber Products Output and Timber Harvest in Alaska: Projections for FY97-10* (Brooks and Haynes; PNW-GTR-409, September, 1997). These projections of Alaska timber products output, the derived demand for raw material, and timber harvest by owner are developed from a trend-based analysis. These projections reflect the consequences of recent changes in the Alaska forest sector and long-term trends in markets for Alaska products. With the closure of the two southeast Alaska pulp mills, demand for Alaska National Forest timber now depends on markets for sawn wood and the ability to export manufacturing residues and lower grade logs. Three alternative projections are used to display a range of possible future demand (Table A–1). Areas of uncertainty include the prospect of continuing changes in markets and in conditions faced by competitors and the speed and magnitude in investment in manufacturing in Alaska.

Demand projections are important for program planning. They provide important guidance to the Forest Service for requesting budgets, for making decisions about workforce and facilities, and for indicating the need to begin new NEPA analysis for future program offerings. They also provide a basis for expectations regarding future harvest, and thus provide an important source of information for establishing the schedule of probable future sale offerings. The weight given to the projections will vary depending on a number of factors, such as how recently they were done, and how well they appear to have accounted for recent, site-specific events in the timber market.

Table A-1 Projected National Forest Harvest

For Fiscal Year 2001-2009, the Tongass National Forest plans to schedule approximately 160 MMBF for sale each year over the life of the Forest Plan. This schedule is based on the projections documented in *Timber Products Output and Timber Harvest in Alaska: Projections for FY97-10* (Brooks and Haynes; PNW-GTR-409, September, 1997), and current volumes in the timber sale pipeline process. Prior to the beginning of Fiscal Year 2001 the amount of volume scheduled in outyears will once again be analyzed to determine if projections made now meet the anticipated needs in the future.

Fiscal Year	Projected Harvest (MMBF)		
	Low	Medium	High
2000	95.5	116.6	142.7
2001	104.6	129.0	157.7
2002	113.7	134.9	173.1
2003	122.8	140.8	188.9
2004	131.9	146.5	205.0
2005	131.9	152.2	221.4
2006	131.9	157.8	238.2
2007	132.0	163.4	255.3
2008	132.0	168.9	272.8
2009	132.1	174.3	290.7
Average	122.8	148.4	214.6
Mean	168.7		

How Does the Forest Service Maintain an Orderly and Predictable Timber Sale Program?

Pools of Timber (Pipeline Volume)

As discussed earlier, the Forest Service tracks accomplishment of various stages of development of each timber sale with the Gate System process. From a timber sale program standpoint, it is also necessary to track and manage multiple projects through time as projects collectively move through the Gate System. Tracking of the multiple projects can be likened to following various segments of several projects through a pipeline of time. Because of the relatively long timeframes needed to accomplish a given timber sale and the complexities inherent in timber sale project and program development, it is necessary to track various timber sale program volumes from Gate 1 through Gate 6. Gate 1 volume represents a large pool of program volume, but represents a relatively low investment from project to project. This relative investment level offers the timber program manager a higher degree of flexibility and thus, does not greatly influence the flow of volume through the pipeline. In addition, tracking of how much volume near the end of the pipeline that is in appeals or litigation may be necessary to determine potential effects on the flow of potential timber sales.

The goal of the Tongass National Forest is to provide an even flow of timber sale offerings on a sustained yield basis. In past years, this has been difficult to accomplish due to continual reductions in the suitable timber land base, reductions in the timber industry processing capabilities, rapid market fluctuations and Forest Plan modifications and litigation. To

achieve an even flow of timber sale offerings, 'pools' of projects in various stages of the Gate System will be maintained so volume offered can be balanced against current year demand and market cycle projections. Today, upward trends in demand are reacted to by moving outyear timber projects forward leaving outyears not capable of meeting the needs of the industry. In other instances, a number of new projects are started based on today's market but not available for a number of years. By the time the added projects are ready for offer, the market and demand for this volume has changed. Three pools are being tracked to achieve an even flow of timber sale offerings:

1. **Timber volume under analysis (Gate 2):** Timber volume under analysis, contains sales being analyzed and undergoing public comment through the NEPA process. This process can often take from one to five years and reaches a significant milestone when a NEPA decision is made. This pool includes any project with a formal Notice of Intent through those with a decision document issued. Volume in appeals and litigation will be tracked as a subset of this pool as necessary.

2. **Timber volume available for sale (Gate 3, Gate 4 and Gate 5):** Timber volume available for sales, contains sales for which environmental analysis has been completed, and administrative appeals, and litigation (if any) have been resolved. They have also been fully prepared, and are available to managers to schedule for sale offerings. Managers need to maintain enough volume in this pool to be able to schedule future sale offerings in an orderly manner of the size and configuration that best meets the need of the public. As a matter of policy, and sound business practice, the Forest Service attempts to announce probable future sale offerings at least one year in advance. This allows potential purchasers an opportunity to do their own evaluations of these offerings in order to determine whether to bid, and if so, at what level.

3. **Timber volume under contract (Gate 6):** Timber volume under contract contains sales which have been sold and a contract awarded to a purchaser, but have not yet been fully harvested. Timber contracts typically, but not always, give the purchaser three years to harvest and remove the timber purchased. Long standing Forest Service practice is to attempt to maintain about two to three years of unharvested timber volume under contract to timber purchasers. This volume of timber is the industry's dependable timber supply which allows immediate flexibility in business decision. This practice is not limited to the Alaska Region, but is particularly pertinent to Alaska because of the nature of the land base. The relative absence of roads, the island geography, the steep terrain, and the consequent isolation of much of the timber land means that timber purchasers need longer-than-average lead times to plan operations, stage equipment, set up camps, and construct roads prior to beginning harvest.

What drives the various timber sale program pipeline pool volume is a combination of actual harvest and projected demand. As purchasers harvest timber, they deplete the volume under contract. Managers track harvest, and offer sales that give the industry as-a-whole the opportunity to replace this volume and build or maintain their working inventory. Although there can be significant variation for practical reasons from year to year, in the long-run, over both the high points and low points of the market cycle, timber harvest will equal timber sales.

The amount of pipeline volume in each of the pools is determined by the Forest Service based on historical patterns. Table A–2 Pipeline Pool Matrix displays what volume levels

are expected to be maintained in each pool. Pool 1-Timber Volume Under Analysis is expected to be maintained at approximately 4.5 times the amount of anticipated harvest; Pool 2-Timber Volume Available for Sale is expected to be maintained at approximately 1.3 times the amount of anticipated harvest, and Pool 3-Volume Under Contract is expected to be maintained at approximately 3 times the amount of anticipated harvest. The objective of the pools concept is to maintain sufficient volume in preparation and under contract to be able to respond to yearly fluctuations in a timely manner.

Table A-2 Pipeline Pool Matrix

Pipeline Pool Volume	Flows	Start of Year One	During Year One	End of Year One
1. Volume Under Analysis **(Gate 2)**		238	401	230
	NEPA Decision	126	343	171
2. Volume Available for Sale **(Gate 3, gate 4 and Gate 5)**		79	266	159
	Offered		163	
	Sold		148	
3. Volume Under Contract **(Gate 6)**		325		352
	Volume Harvested*		121	

* Note—The amount of volume estimated to be harvested for the year sets the basis for what will be maintained in Pools 1–3 **(Gates 2 through 6)**. Should this estimated be incorrect, adjustments can be made in the following years without significant departures in outyear programs capabilities.

Matrix crosswalk between Gate Tracking System and Pools of Timber Concept:
Gate 2: Proposed timber volume with a published decision document (Record of Decision) that is viable for sale after completion of appeals and litigation.
Gate 3: NEPA cleared timber volume with field preparation work completed and the timber sale ready to be offered in a timber sale contract package.
Gate 6: Timber volume under contract.

Timber volume in appeals and/or enjoined in litigation.*	55 Million Board Feet

*As of 09/30/99. The volume in appeals and or enjoined in litigation is updated on a quarterly basis.

How Does the Forest Service Decide Where Timber Sale Projects Should be Located?

The Allowable Sale Quantity (ASQ)

The Forest Plan Record of Decision established an ASQ for timber at 1.87 billion board feet per decade which equates to an annual average of 187 million board feet (MMBF). The ASQ serves as an upper limit on the amount of timber that may be offered for sale as part of the regularly scheduled timber sale program. It consists of two separate Non-Interchangeable Components (NIC's) called NIC I, which is 1.53 billion board feet of timber per decade, and NIC II, which is .34 billion board feet per decade. The purposes of partitioning the ASQ into two components are to maintain the economic sustainability of the timber resource by preventing the over-harvest of the best operable ground, and to identify that portion of the timber supply that is at risk of attainment because of marginal economic conditions. The NIC I component includes lands that can be harvested with normal logging systems. The NIC II component includes land that has high logging costs due to isolation or special equipment requirements. Most of these NIC II lands are presently considered economically and technically marginal.

Immediately following the issuance of the Forest Plan Record of Decision by the Deputy Under Secretary of Agriculture, James Lyons, the Forest Service began an analysis of the ROD to develop consistent methodologies for its implementation (Implementation of Tongass Land Management Plan, 1920/1950, James A. Bartelme, Forest Supervisor, May 11, 1999). The purpose of the analysis was to develop methodology to ensure the modified Forest Plan changes received a consistent implementation approach across the Tongass, and to determine where the land base existed to begin programming current and future timber sale projects.

The Tongass National Forest has been unified under one Forest Supervisor overseeing the three combined Administrative Areas (Chatham, Stikine and Ketchikan). The allowable sale quantity is disaggregated by Ranger District offices for planning and scheduling purposes. Each District has been allocated a portion of the timber harvest program based on the FORPLAN computer run and availability of suitable and available acres, to implement the Forest Plan, and Section 101 of the Tongass Timber Reform Act (1990). The Forest Plan set the Forest allowable sale quantity (ASQ) upper limit at 187 MMBF per year. The distribution of the planned ASQ harvest among the Districts is listed in Table A–3 (All volumes are identified as sawlog plus utility):

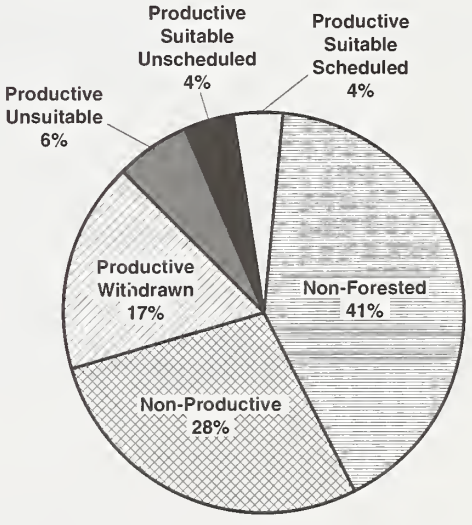
Table A-3 Distribution of ASQ Among the Tongass National Forest Ranger Districts

Historically, timber harvest activities were generally concentrated in the central and southern portions of the Tongass. Now, under the Forest Plan, the suitable timber land base is more evenly distributed across the Forest. As a result, it is necessary to lessen harvest on the southern end and begin planning projects in areas further north. In answer to the question presented for this section of the Appendix, the suitable timber base is capable of producing the ASQ documented in the Forest Plan Record of Decision. However, harvest activities will be more evenly distributed than they were in the past.

Tongass NF Ranger District	Non-Interchangeable Components	
	NIC I	NIC II
Ketchikan	18	4
Thorne Bay	21	5
Craig	18	4
Wrangell	24	4
Petersburg	37	8
Sitka	12	3
Hoonah	6	2
Juneau	12	3
Yakutat	5	1
Admiralty	0	0
NIC Totals	153	34
ASQ Total	187	

Chart A-1 Forest Plan Land Allocations

Chart A–1 Forest Plan Land Allocations depicts the productive suitable land base that is scheduled for timber harvest activities. Four percent of the Tongass land base generates the allowable sale quantity of 187 MMBF per year. The remainder of the land, approximately ninety-six percent, does not allow or will not support timber harvest activities.



District-Level Planning

The Forest Supervisor for the Tongass National Forest has discrete responsibilities for the overall management of the Forest's timber sale program. Included within these responsibilities is making the determination on the amount of timber volume to be made available to the industry as described above. Once a determination is made for the current year (annual demand) offer level, the information is presented to Congress via the Regional Forester and Chief of the Forest Service. Whether or not funding is appropriated to attain the program is the responsibility of the Congress and the President of the United States.

While the debate on funding takes place, the Tongass Forest Supervisor directs the District Rangers to formulate timber sale schedules that attain the prescribed offer level for the current year as well as develop outyear timber programs based on projected market demand for the planning cycle. It is the Ranger's role to recommend to the Forest Supervisor timber sale projects that meet forest plan goals and objectives. Districts work on various projects simultaneously resulting in continual movement of projects through the stages of the timber program pipeline. Their schedule allows the necessary time to complete preliminary analysis, resource inventories, environmental documentation, field layout preparations and permit acquisition, appraisal of timber resource values, advertisement of sale characteristics for potential bidders, bid opening, and physical award of the timber sale. Once all of the Rangers' recommendations are made and compiled into a consolidated schedule, the Forest Supervisor is responsible for the review and approval of the final plan.

Pending Congressional appropriations, the sale schedule is implemented. In the event insufficient funds are appropriated to achieve the desired outputs, timber sale projects are selected and implemented on a priority basis. Generally, the higher priority projects include sales where investments such as, road networks, camps or log transfer facilities have already been established. Those sales that are not implemented or only partially implemented are moved to the outyears. The sale schedule becomes very dynamic in nature due to the number of influences on each of the districts. A formal review of the schedule is done annually by the Forest Supervisor in consultation with the District Rangers, and amendments are made as needed through the course of the year. (The Tongass Timber Sale Plan is located on the Tongass National Forest Website.)

The National Forest Management Act requires the Forest Service to develop timber sale schedules that encompass the life of the forest plan. The recent Tongass National Forest planning process culminated upon issuance of the Forest Plan Record of Decision for the Tongass Land and Resource Management Plan. In response to this Plan, the Tongass has prepared a Ten Year Timber Sale Schedule for Fiscal Years 2000-2009. Fiscal Year 2000 offer level is based on annual market demand estimates. The remaining years, 2001-2009 are based on market demand projections over the planning cycle. Table A–4 Tongass Ten Year Timber Sale Schedule-Fiscal Year 2000, denotes the first year of the ten-year plan. Fiscal Year 2000 is listed below to show the reader an example of the information available and display the timber sales scheduled for the current fiscal year.

Table A-4 Tongass Ten Year Timber Sale Schedule-Fiscal Year 2000

NEPA	Decision		S + U	Sale	Vol S + U		FY00 Gate	FY00 Gate	Gate
Project	Date	RD	(MMBF)	Name	(MMBF)	Class	2	3	5
Sea Level EIS	May-99	KRD		Madder	26	S			26
Sea Level EIS	x	KRD		Buckdance	11	S			11
Sea Level EIS	x	KRD		Orion	13	S			13
Craig Small Sales EA	x	CRD	1.5	Craig Small Sales	1.5	S	1.5	1.5	1.5
TNB Small Sales EA	x	TNB	5	Various	5	S	5	5	5
Luck Lake EIS	Jan-00	TNB	13	Luck Lake	5	S	13	5	5
Luck Lake EIS	x	TNB		Twin Bridge	8	S		8	8
Couverdan CE	Jun-00	JRD	0.8	Couverdan Salvage	0.8	S	0.8	0.8	0.8
8–FATHOM EIS	Apr-96	HRD		Midway	6.4	S		6.4	6.4
HRD Small Sales EA	x	HRD	0.2	Small sales	0.2	S	0.2	0.2	0.2
NW BARANOF EIS	Feb-96	SRD		Schultz	8	S		1	8
Small Salvage Sale CE	x	YRD	0.2	Small Salvage Sale-00	0.2	S	0.2	0.2	0.2
Woodpecker EIS	(May-00)	PRD	(5–18)	Woodwork	1	S	18	1	1
Twin Creek EA	Aug-98	PRD		Twin Creek heli (41,66)	1.5	S		1.5	1.5
Twin Creek EA	Aug-98	PRD		Twin Creek 15	0.1	S		0.1	0.1
South Lindenberg EIS	Dec-96	PRD		South Central (U140)	1.5	S		1.5	1.5
South Lindenberg EIS	Dec-96	PRD		S. Lindy SE	10	S		10	10
East Fork EA	Jul-88	PRD		East Fork	2	S		2	2
Bohemia Mountain EIS	Jun-95	PRD		Goose (Unit 538)	1	S		1	1
Doughnut EA	x	WRD	8	Doughnut	4	O	8	4	4
Skipping Cow EIS (X)	x	WRD	20	Skipping Cow	20	S	20	20	20
Kuakan EIS	x	WRD	12	Kuakan	12	S	12	12	12
	Total		40		138.2		40	81.2	138.2

NOTE: The difference between projected volume (148 MMBF) and offer volume (138 MMBF) will be made up from re-offer/reconfigured unsold FY 98/99 timber sales.

The Ten Year Schedule provides a significant amount of information and is described as follows:

Title	Description
NEPA Project	Environmental document project name. This name may or may not differ from the timber sale project name depending on how many sales originate from the original NEPA document.
Decision Date	The date of the decision document whether planned or actual. 'X' denotes project has started and completion is within the FY noted.
RD	Ranger district office project is located (PRD = Petersburg Ranger District).
S + U (MMBF)	Anticipated timber volume (sawlog plus utility) expected from the NEPA document. Generally only appears once in the year the decision is made. If no volume shown, decision on document was made in another fiscal year.
Sale Name	Timber sale project name.
Vol S + U (MMBF)	Timber sale project volume (sawlog plus utility).
Class	Timber sale size class determination (S – SBA, O = open sale to all bidders).
FY 00 Gate 2 (NEPA)	Only appears in the year the NEPA document will be decided. Number designates potential volume.
FY 00 Gate 3 (Layout)	Only appears in fiscal year sale is to be laid out and appraised. May appear in more than one year.
FY 00 Gate 5 (Offer)	Only appears in fiscal year sale is to be offered. Number designates potential volume.

The location of timber sale projects are based on the land allocation directed in the Forest Plan decision. Timber sales are located where permitted based on the prescription and objectives of the land use designation. Timber sale projects are located to varying degrees in land use designations identified as timber production, modified landscape, and scenic viewshed.

As stated earlier, the District Ranger is responsible for identifying and recommending the project areas for the Ten Year Timber Sale Schedule. The considerations the Ranger makes on each project includes but are not limited to the following:

1. The project area contains a sufficient number of acres allocated to development land use designations to make timber harvest in the area appropriate under the Forest Plan. There is an adequate amount of suitable and available land for timber harvest opportunities. Available information indicates harvest of the amount of timber volume being considered for this project can occur consistent with the Forest Plan standards and guidelines and other resource protection requirements.
2. The project and proposed timber harvest volume can contribute to achieving the goals and objectives of implementing the Forest Plan.
3. The potential investment in infrastructure (roads, bridges, log transfer facilities, camps,

rock pits, etc.) is necessary for sustainable timber harvest offerings. Where infrastructure already exists, this project will enable maintenance and upgrade of the facilities, which is necessary for removal of timber volume.

4. The potential effects on subsistence and other resources.
5. Based on current year and anticipated outyear timber volume demand; volume currently under contract; anticipated Congressional allocations; and the availability of resources to fully prepare and offer this project for sale, this project is consistent and meets Forest Service Policy in the Alaska Region, Regional Guide; Best Management Practices; the Tongass Land and Resource Management Plan; and all other laws and regulations governing the removal of timber from National Forest System Lands.

How Does This Project Fit into the Tongass Timber Program?

The Emerald Bay Project is scheduled for offer in Fiscal Year 2001, (Tongass National Forest Ten Year Timber Sale Schedule, approved by Thomas Puchlerz, Forest Supervisor, dated October 20, 1999). Forest-wide, total offer volume being planned for Fiscal Year 2001 is 162.9 MMBF. In order to achieve the planned offer date, the Emerald Bay Project has a scheduled Gate 2 completion date of Fiscal Year 2000 with Gate 3 implementation to begin in Fiscal Year 2000.

The Emerald Bay Project is currently in Gate 2, "Volume Under Analysis". The project's action alternatives being addressed in the NEPA analysis range from 8 MMBF to 16 MMBF that could contribute to the Tongass Timber Sale Program. As described earlier, the volume of timber needed to maintain the NEPA decision pool during year one is 343 MMBF. Currently, forest-wide the NEPA decision pool contains 126 MMBF exclusive of this project. **Potential** selection of an action alternative for this project would bring the volume in the NEPA decision pool between 134 and 142 MMBF. Therefore, the Emerald Bay Project is consistent with the program planning objectives and necessary to meet the goal of providing an orderly flow of timber from the Tongass on a sustained yield basis. Given the included information, it is reasonable to be conducting the environmental analysis for this project at this time.

Why Can't This Project Occur Somewhere Else?

As previously discussed, the market demand for timber for the next ten years is expected to average 160 MMBF per year. The suitable and available land base on the Tongass is capable of supporting an Allowable Sale Quantity of 187 MMBF annually, 153 MMBF of which is considered economical (i.e. the NIC I component). Based on the projected market demand for the planning cycle, all suitable timberlands will eventually be scheduled for harvest to meet the current and projected demand for raw material in Southeast Alaska. The cumulative impact on other resources from past harvest activities, the location of timber sales under contract, and the eventual use of all suitable lands for timber sale projects makes the relocation of this project in another area inefficient and potentially contrary to the standards and guidelines of the Forest Plan.

- Areas with available timber will be necessary to consider for harvest in order to seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle, pursuant to Section 101 of the Tongass Timber Reform

Act (TTRA).

- The potential effects on subsistence resources are projected to differ little based on the sequence these areas are harvested. Harvesting other areas with available timber on the Tongass National Forest is expected to have similar potential effects on resources, including those used for subsistence, because of widespread distribution of subsistence use and other factors. Harvest within other areas is foreseeable, in any case over the forest planning horizon under the Forest Plan.
- Providing substantially less timber volume than required to meet Forest Plan and TTRA Section 101 timber supply and employment objectives in order to avoid harvest in the project area is not necessary or reasonable.
- It is reasonable to schedule harvest in the project area rather than in other areas at the present time based on previous harvest entry and access, level of controversy over subsistence and other effects, the ability to the complete National Environmental Policy Act (NEPA) process and make timber available to meet the needs of dependent industries. Other areas that are reasonable to consider for harvest in the near future are the subject of other project EIS's that are currently ongoing or scheduled to begin soon.

Appendix B

Unit Cards

NOTE: Some unit cards have more than one unit map.

Alternative B Emerald Bay Study Area Draft EIS Unit 1a

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

0 .05 0.1 Miles

Mapscale 1:12000

Alternative B Emerald Bay Study Area Draft EIS Unit 1b

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 1
Alternative: B

Harvest Acres: 109 **MBF Volume:** 2361 **CCF Volume:** 4722
Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 31

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
There are approximately 14 acres of Forested Wetlands in the northwest corner of Unit 1a. Most of the wetland area is planned for shovel yarding and individual tree selection. Shovel yarding needs to follow the guidelines documented in BMP 13.9. Bearing strength of the soils in the area is low. There are inclusions of forested organic soils in the unit. Suitability for shovel yarding will be somewhat dependant on soil moisture. Shovel yarding should only take place in the summer when soil moisture contents are low and bearing strengths higher. A running skyline system with a minimum of partial suspension is preferred if it can be accomplished without additional road (BMP 12.5).

Landslide Prone Soils
The soils in Unit 1 lie on slopes less than 60 percent gradient and are not landslide prone. Soils mapped are deep and somewhat erodible. BMP 12.17, "Revegetation of Disturbed Areas" should be used to treat any areas disturbed during the yarding process. Partial suspension is required in the cable yard portion of the unit (BMP 13.9).

Fisheries/Hydrology
The north boundary of Units 1a and 1b are adjacent to the stream buffer on Emerald Creek. The riparian area is defined by a timber type change. A windfirm boundary needs to be established next to the no-cut buffer.
Class IV HC5 flows through southwest Unit 1a corner. Directional felling, split yarding, and full suspension may be required.
Class II MM1 adjacent to north boundary of Units 1a and 1b: greater of 120 foot or RMA buffer required, additional 120 foot select harvest windfirm buffer required.
Class II PA5 adjacent to Unit 1a northwest boundary: greater of 100 foot or RMA buffer required; additional 85 foot select harvest windfirm buffer required.
Follow BMPs 12.6, 12.6a and 13.16.

Silvicultural Prescription
Unit 1a: Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Unit 1b: Clearcut

Logging System and Unit Design
Cable log using running skyline with partial suspension for all of Unit 1b and the northwest portion of Unit 1a. Shovel yard the remainder of Unit 1a.

Alternative B Emerald Bay Study Area Draft EIS Unit 3

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 3
Alternative: B

Harvest Acres: 76 **MBF Volume:** 1617 **CCF Volume:** 3234

Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 32

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
Almost all of Unit 3 lies on a Forested Wetland and Forested Upland complex. The wetlands occur on moderately sloping to steep mineral soils. A minimum of partial suspension is required. The unit is planned for slackline and helicopter yarding, which will meet resource objectives (BMP 12.5 and 13.9).

Landslide Prone Soils
Soils in Unit 3 are steep with an estimated 15 acres on slopes over 72 percent gradient. To meet soil resource concerns, four of the acres are in a leave island and the remaining slopes over 72 percent are in a partial cut helicopter yard setting (BMPs 13.5, 13.9, and 13.2). Partial suspension is required in the cable log portion of the unit (BMP 13.9).

Fisheries/Hydrology
Unit 3 borders Emerald Creek to the south and a water-quality stream to the east. The Class III water-quality stream has formed a small alluvial deposit on the eastern boundary of Unit 3; the no-cut buffer should include the alluvium deposit.
Class III HC5 adjacent to east unit boundary: no timber harvest within the V-notch or on the alluvium deposit, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak/alluvium for windfirmness.
Class II HC1 adjacent to southeast unit corner: no harvest within the greater of 100 feet or the V-notch; manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class II PA5 adjacent to south boundary: greater of 100 foot or RMA buffer required; additional 85 foot select harvest windfirm buffer required.
Follow BMPs 12.6, 12.6a and 13.16.

Silvicultural Prescription
Individual Tree Selection: on approximately 28 acres at the north end of the unit. Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Clearcut: Approximately 47 acres.

Logging System and Unit Design
Helicopter yard 28 acres in the northern end of the unit to the road.
Cable yard with running skyline the remaining 47 acres.

Alternative B Emerald Bay Study Area Draft EIS Unit 5

- Class 1 Stream
- Class 2 Stream
- Class 3 Stream
- Class 4 Stream
- Unit Boundary
- Temporary Roads
- Spec Roads
- Salt Water
- Fresh Water Lakes
- Riparian Areas
- Encumbered Land
- Private Land
- Old Growth Reserves
- MM–Haz 4 Soils
- Slopes > 72%
- Windfirm Area
- High Value Marten

N W E S

0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 5
Alternative: B

Harvest Acres: 55 **MBF Volume:** 1050 **CCF Volume:** 2100

Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 32

Resource Concerns and Mitigation

Wildlife

Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery

This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands

All of Unit 5 is mapped as a complex of Forested Wetlands and Forested Uplands. The Forested Wetlands are on mineral soils on moderately to steeply sloping ground. Unit 5 is planned for helicopter yarding with full suspension, which will meet resource objectives outlined in BMP 12.5 and 13.9.

Landslide Prone Soils

There is approximately 1 acre of slopes greater than 72 percent gradient in Unit 5. The pitch is very short and landslide potential appears to be low (BMP 13.5). A minimum of partial suspension is required, and full suspension is planned via helicopter yarding (BMP 13.9).

Fisheries/Hydrology

Class III HC5 adjacent to tip of east unit boundary: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.

Silvicultural Prescription

Individual Tree Selection: on approximately 32 acres of the unit. Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

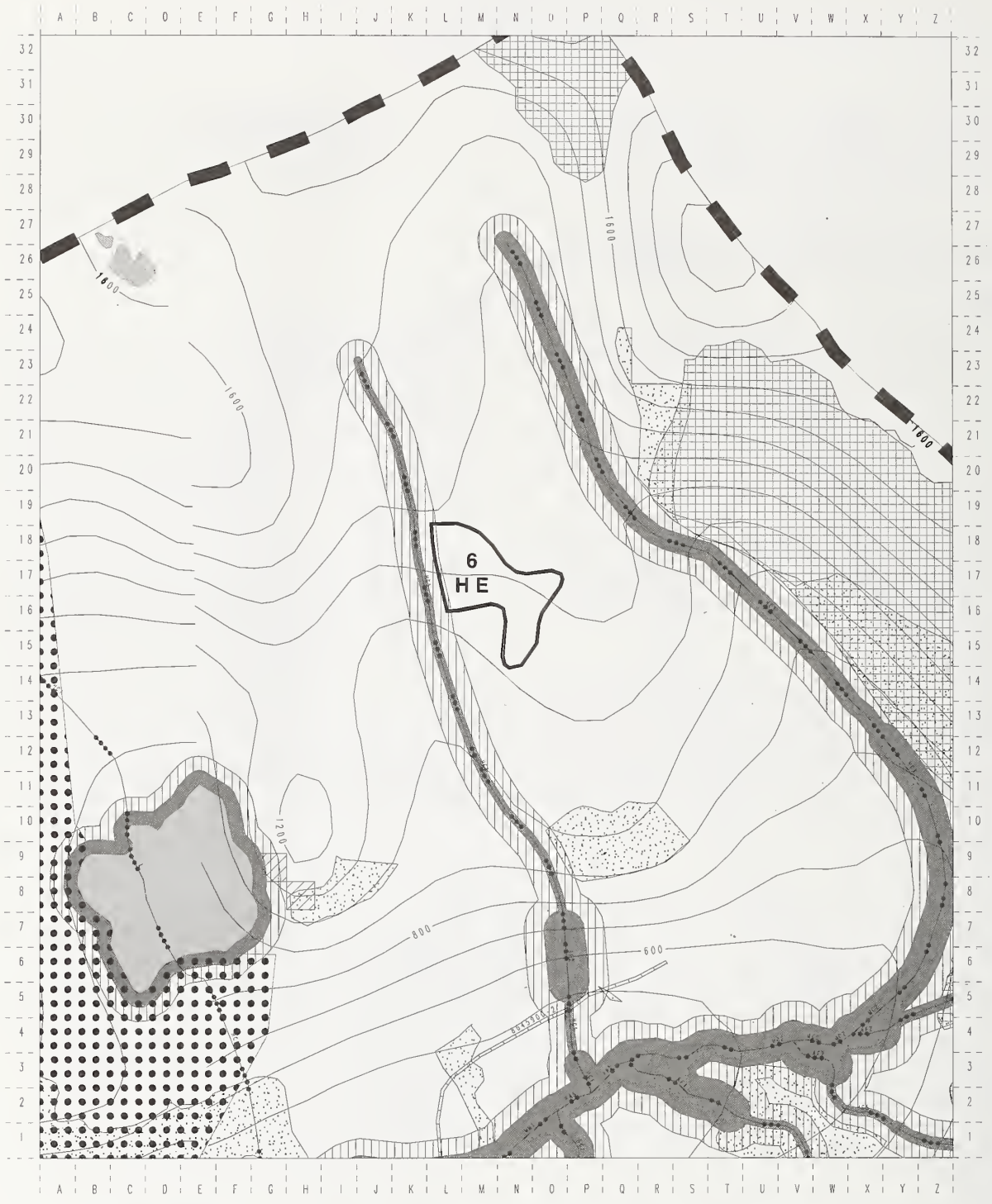
Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Clearcut approximately 23 acres.

Logging System and Unit Design

Helicopter yard to road.

Alternative B Emerald Bay Study Area Draft EIS Unit 6



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 6
Alternative: B

Harvest Acres: 10 **MBF Volume:** 200 **CCF Volume:** 400

Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 32

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
The entire unit is mapped as Forested Wetland, cedar-hemlock-blueberry plant association. Full suspension via helicopter yarding will provide a low-impact yarding method per BMP 12.5.

Landslide Prone Soils
There are perhaps 2 acres of slopes greater than 72 percent in the unit associated with a small cliff. The soils in the unit have a low to moderate mass movement index (BMP 13.5). A minimum of partial suspension is required. Full suspension via helicopter yarding will be achieved (BMP 13.9).

Fisheries/Hydrology
Class III HC5 adjacent to west unit boundary: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.

Silvicultural Prescription
Clearcut

Logging System and Unit Design
Helicopter yard to road.

Alternative B Emerald Bay Study Area Draft EIS Unit 9

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 9
Alternative: B

Harvest Acres: 39 **MBF Volume:** 740 **CCF Volume:** 1480

Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 32

Resource Concerns and Mitigation

Wildlife

Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery

This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands

Nearly the entire unit is mapped as a Forested Wetland and Forested Wetland and Upland complex. A 1 acre non-forested poor fen (muskeg) lies in the southwest corner of the unit adjacent to the stream buffer on the west side of the unit. The muskeg could be included in the stream buffer (BMP 12.5 & 13.16). Partial suspension is required on the remainder of the unit (BMP 13.9).

Landslide Prone Soils

Slopes in Unit 9 range up to 60 percent gradient and no slopes over 72 percent were identified (BMP 13.5). Partial suspension is required to protect wetlands and prevent erosion (BMPs 13.9, 12.5 & 13.14).

Unit 9 is bordered by a water-quality stream to the west and a Class II stream with high-value fish habitat, wetland, and riparian area to the south (BMPs 12.5 & 12.6l). The area south of the unit is fluvial and supports the only tall sedge fen identified on the Project Area. This area will require a windfirm buffer that includes the entire riparian area (BMPs 12.6a & 13.16). The extent of the riparian area needs to be verified during project implementation.
Class III HC5 adjacent to west unit boundary: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class III AF2 adjacent to west boundary: a buffer that is the greater of 140 foot or active portion of alluvial fan is required.
Class II HC1 adjacent to southwest unit corner: no harvest within the greater of 100 feet or the V-notch; manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class II PA5 adjacent to south boundary: greater of 100 foot or RMA buffer required; additional 85 foot select harvest windfirm buffer required.
Class II MC2 adjacent to south boundary: no harvest within the greater of 100 feet or the channel sideslope break required.

Silvicultural Prescription

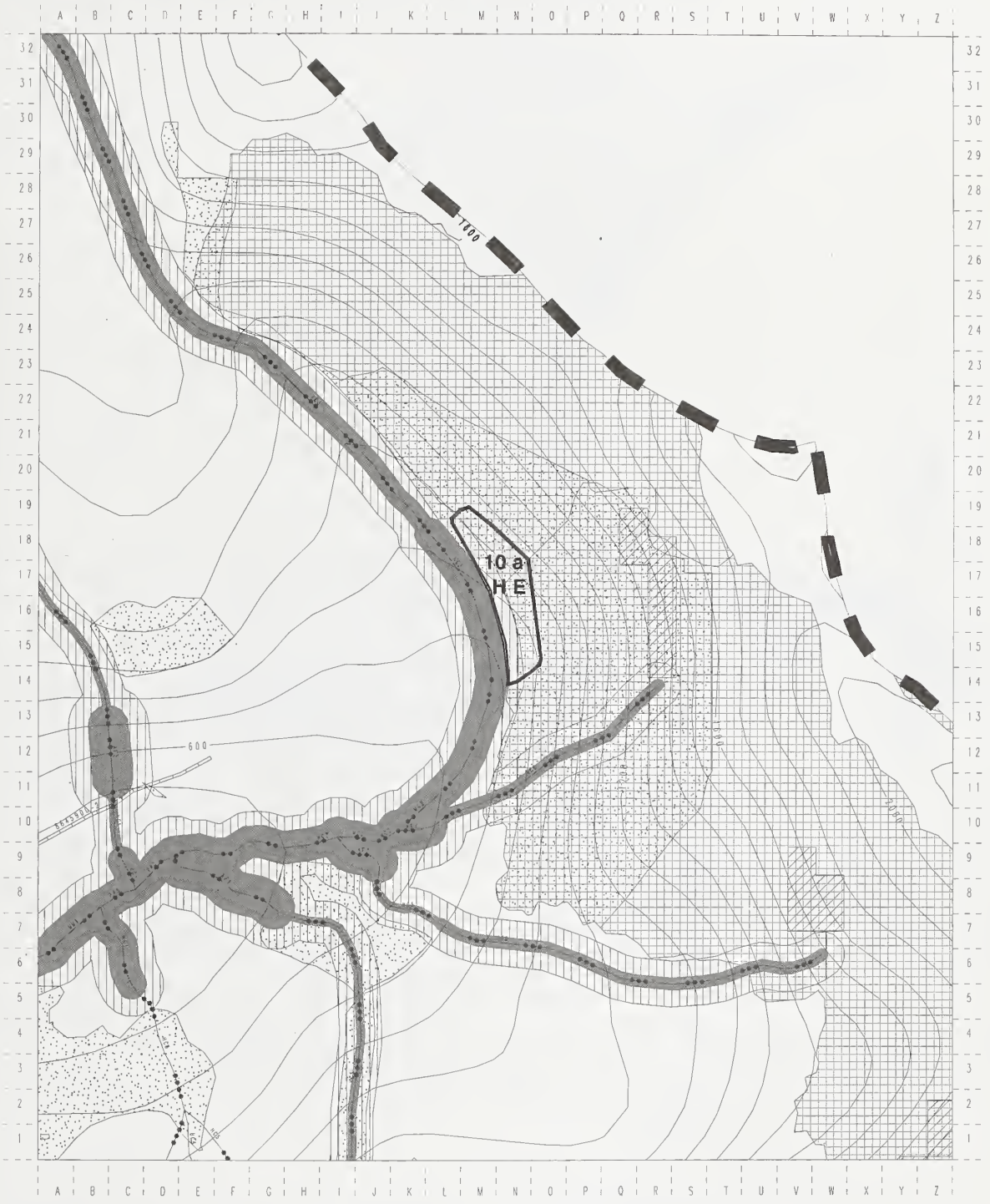
Clearcut with Reserves leaving approximately 9 acres in reserves.

Logging System and Unit Design

Cable yard running skyline.

Fisheries/Hydrology

Alternative B Emerald Bay Study Area Draft EIS Unit 10a



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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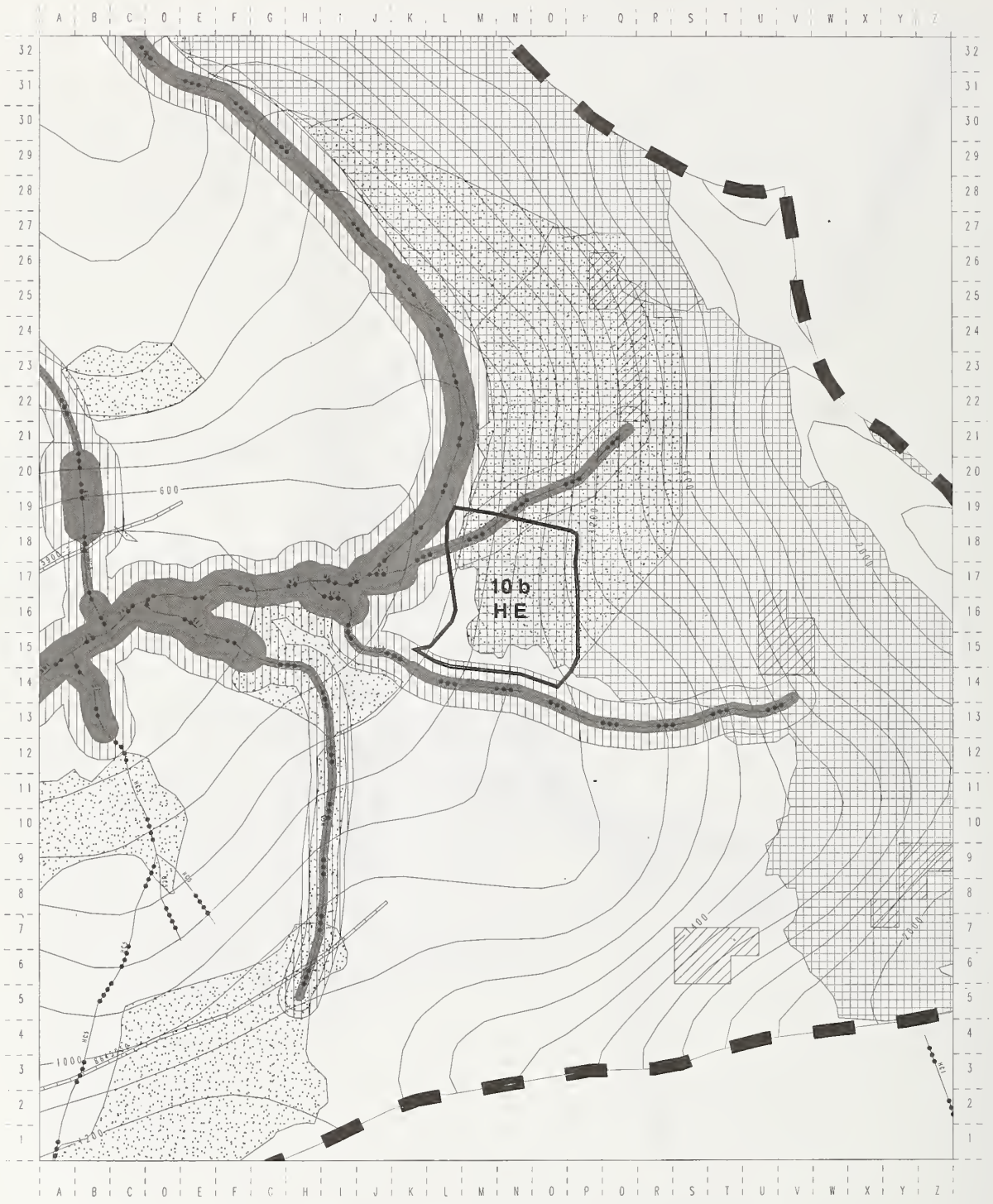
0 .05 0.1 Miles

Mapscale 1:12000

Alternative B Emerald Bay Study Area Draft EIS Unit 10b



- Class 1 Stream
- Class 2 Stream
- Class 3 Stream
- Class 4 Stream
- Unit Boundary
- Temporary Roads
- Spec Roads
- Salt Water
- Fresh Water Lakes
- Riparian Areas
- Encumbered Land
- Private Land
- Old Growth Reserves
- MM–Haz 4 Soils
- Slopes > 72%
- Windfirm Area
- High Value Marten

N W E S

0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 10
Alternative: B

Harvest Acres: 31 **MBF Volume:** 709 **CCF Volume:** 1418
Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 32

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
The south end of Unit 10b is mapped as Forested Wetland. The remainder of the unit is mapped as Forested Upland and Forested Wetland complex. Field verification indicates that the unit is mostly uplands. Partial suspension is required to protect wetlands (BMP 12.5). Full suspension is planned via helicopter yarding (BMP 13.9).

Landslide Prone Soils
Slopes in Unit 10a and 10b are less than 60 percent gradient. No slopes over 72 percent were identified. The mass movement rating ranges from low to high in Unit 10b and low in Unit 10a. A minimum of partial suspension is required to prevent erosion (BMP 13.9 and 13.14). Full suspension is planned via helicopter yarding. Unit 10 is also planned for a selective harvest which will further minimize erosion.

Fisheries/Hydrology
The western boundary of Unit 10a is next to the mainstem. Unit 10b lies between the mainstem and a Class III tributary. A smaller Class III stream flows through the northwest corner of Unit 10b.
Class II HC3 adjacent to west Unit 10a boundary: no harvest within the greater of 100 feet or the V-notch; manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class II MC2 adjacent to west Unit 10a boundary: no harvest within the greater of 100 feet or the channel sideslope break required; manage a reasonable distance (site potential tree height is 100 feet) beyond the slopebreak for windfirmness.
Class II MC2 adjacent to northwest Unit 10b boundary: no harvest within the greater of 100 feet or the channel sideslope break required; manage a reasonable distance (site potential tree height is 100 feet) beyond the slopebreak for windfirmness.
Class III HC6 adjacent to south Unit 10b boundary: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class III HC6 transects northwest corner of Unit 10b: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Follow BMPs 12.6, 12.6a and 13.16.

Silvicultural Prescription
Unit 10a: Clearcut
Unit 10b: Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Logging System and Unit Design
Helicopter yard to road.

Alternative B Emerald Bay Study Area Draft EIS Unit 11

- Class 1 Stream
- Class 2 Stream
- Class 3 Stream
- Class 4 Stream
- Unit Boundary
- Temporary Roads
- Spec Roads
- Salt Water
- Fresh Water Lakes
- Riparian Areas
- Encumbered Land
- Private Land
- Old Growth Reserves
- MM–Haz 4 Soils
- Slopes > 72%
- Windfirm Area
- High Value Marten

N W E S

0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 11
Alternative: B

Harvest Acres: 105 **MBF Volume:** 2200 **CCF Volume:** 4400
Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 31

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
There are approximately 30 acres of Forested Wetlands on mineral soils in the east end of Unit 11. Partial suspension is required in this area (BMP 12.5 and 13.9)

Landslide Prone Soils
Slopes are dominantly less than 60 percent gradient in Unit 11 and no slopes over 72 percent were identified. The mass movement index ranges from low to high in the unit and partial suspension is required (BMP 13.9). Soils mapped in the west end of the unit are relatively deep and somewhat erodible. Areas disturbed during logging should be revegetated as soon as possible to prevent erosion (BMP 12.17).

Fisheries/Hydrology
Class III HC6 adjacent to east unit boundary: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class III HC5 flows north through unit: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class IV HC5 adjacent to southwest unit boundary. Directional felling required.
Follow BMPs 12.6, 12.6a and 13.16.

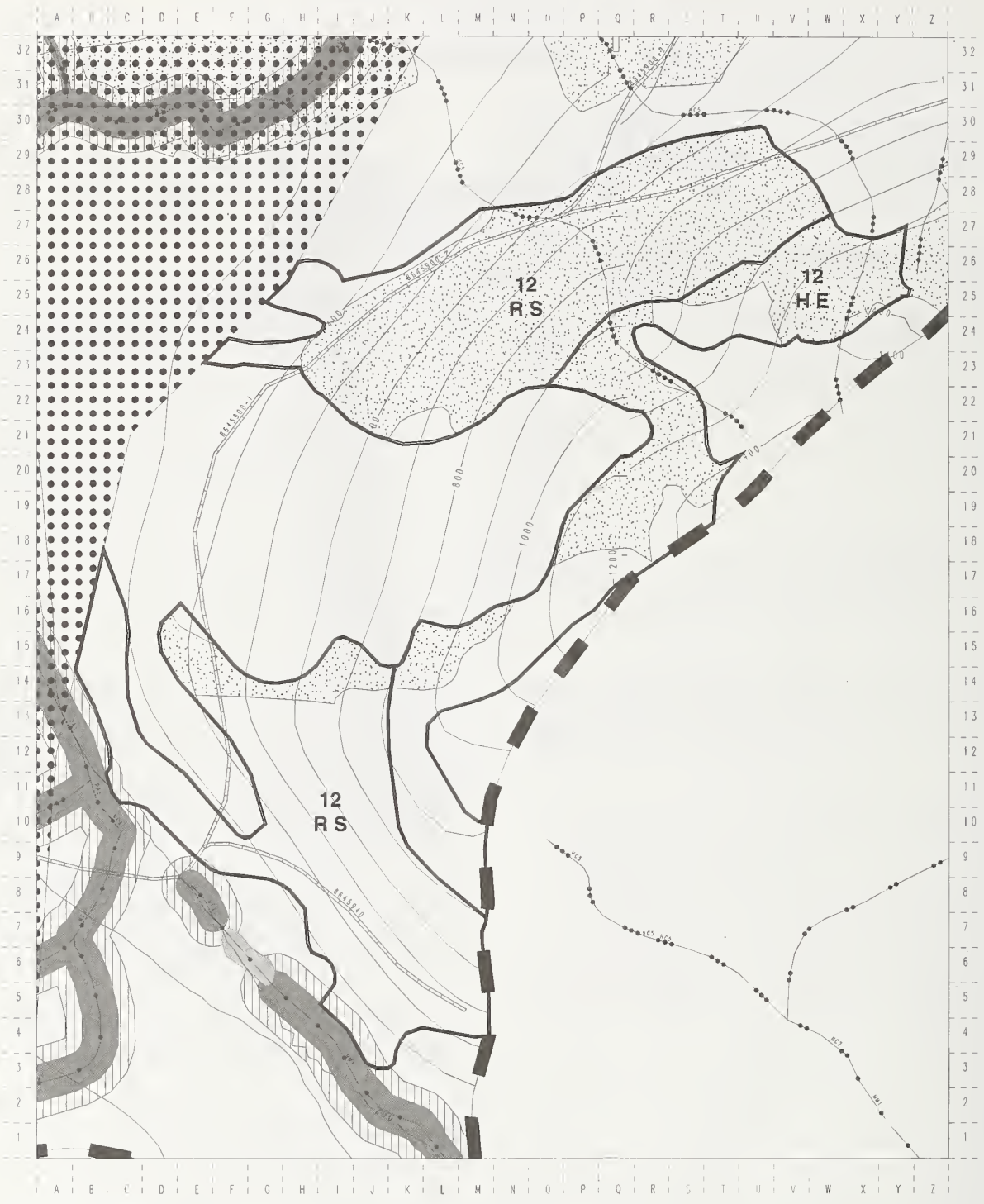
Silvicultural Prescription
Individual Tree Selection: on approximately 7 acres. Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Clearcut with Reserves for the remainder of unit with approximately 24 acres in reserves.

Logging System and Unit Design
Helicopter yard 7 acres to road.
Cable yard remainder of unit.

Alternative B Emerald Bay Study Area Draft EIS Unit 12



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 12
Alternative: B

Harvest Acres: 274 **MBF Volume:** 5776 **CCF Volume:** 11552
Aerial Photo: 1973 **Flight #:** 28 **Photo #:** 217

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
The unit boundary has been modified to avoid timber harvest on forested organic soils per the TLMP ROD. The southern quarter of Unit 12 lies on Forested Wetlands. Partial suspension is required (BMP 12.5 &13.9). Most of the unit is underlain by well-drained upland soils.

Landslide Prone Soils
Slopes in Unit 12 range from 20 up to 70 percent gradient. No slopes over 72 percent were identifiied. The landslide potential ranges from low to high. Partial suspension is required to mitigate landslide and erosion potential (BMP 13.9). Soils under much of the unit are deep and somewhat erodible. Revegetation of any areas disturbed during yarding should be completed as soon as possible (BMP 12.17).

Fisheries/Hydrology
A Class I stream with a pond and short sedge wetland drains the west end of the unit. The short sedge wetland is part of the riparian area around the pond.
Class 1 MC1 adjacent to west boundary: no harvest within the greater of 100 feet or the channel sideslope break required, manage a reasonable distance (site potential tree height is 100 feet) beyond the slopebreak for windfirmness.
Class I PA5 adjacent to west boundary: greater of 100 foot or RMA buffer required; manage a reasonable distance (site potential tree height is 85 feet) beyond the slopebreak for windfirmness.
Class I MM1 adjacent to west boundary: greater of 120 feet or RMA buffer required; manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class IV HC5 (two) flow through northern part of unit. Directional felling, split yarding, and full suspension may be required.
Follow BMPs 12.6, and 13.16.

Silvicultural Prescription
Individual Tree Selection: on approximately 84 acres. Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Clearcut the remainder of the unit.

Logging System and Unit Design
Helicopter yard 84 acres to the road.
Cable yard the remainder of the unit.

Alternative C Emerald Bay Study Area Draft EIS Unit 1

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 1
Alternative: C

Harvest Acres: 118 **MBF Volume:** 1791 **CCF Volume:** 3582
Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 31

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
There are approximately 14 acres of Forested Wetlands in the northwest corner of Unit 1a. The wetland area is planned for helicopter yarding and individual tree selection. Full suspension and individual tree selection will easily meet the resource objectives outlined in BMPs 12.5 and 13.9.

Landslide Prone Soils
The soils in Unit 1 lie on slopes less than 60 percent gradient and are not landslide prone. Soils mapped are deep and somewhat erodible. A minimum of partial suspension is required. Full suspension and individual tree selection is planned, and meets BMP 13.9.

Fisheries/Hydrology
The north unit boundary is adjacent to the stream buffer on Emerald Creek. The riparian area is defined by a timber type change. A windfirm boundary needs to be established next to the no-cut buffer.
Class IV HC5 flows through southwest unit corner. Directional felling, split yarding, and full suspension may be required.
Class II MM1 adjacent to north unit boundary: greater of 120 foot or RMA buffer required, additional 120 foot select harvest windfirm buffer required.
Class II PA5 adjacent to north boundary: greater of 100 foot or RMA buffer required; additional 85 foot select harvest windfirm buffer required.
Follow BMPs 12.6, 12.6a and 13.16.

Silvicultural Prescription (Individual Tree & Group Selection)
Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Harvest 4 acres using Group Selection removing all merchantable trees from areas ranging from 1/4 to 2 acres in size. Leave at least 200 feet between groups.

Logging System and Unit Design
Helicopter harvest to a barge in Emerald Bay.

Alternative C Emerald Bay Study Area Draft EIS Unit 2a

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Alternative C Emerald Bay Study Area Draft EIS Unit 2b

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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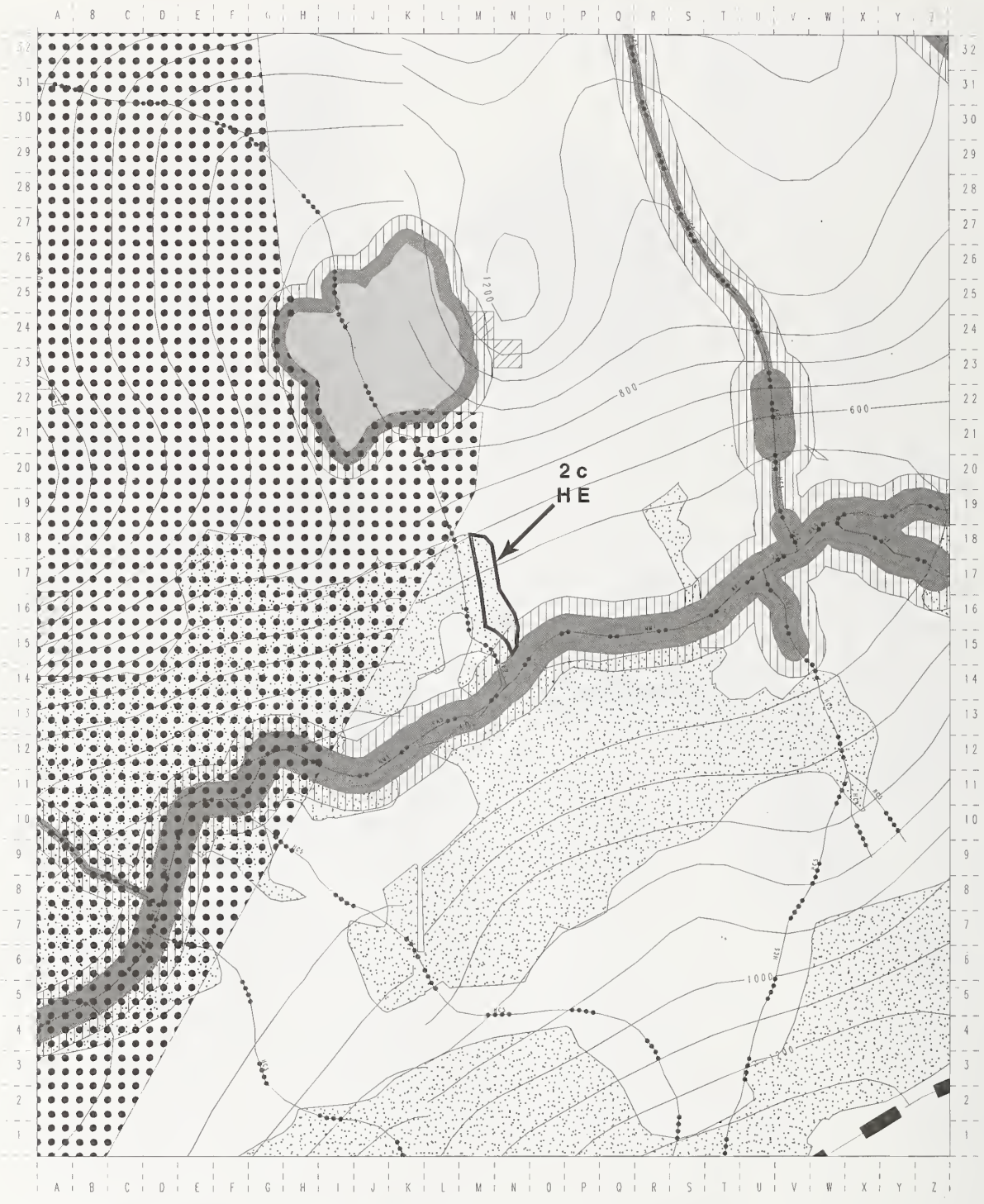
0 .05 0.1 Miles

Mapscale 1:12000

Alternative C Emerald Bay Study Area Draft EIS Unit 2c



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 2
Alternative: C

Harvest Acres: 11 **MBF Volume:** 163 **CCF Volume:** 326
Aerial Photo: 1973 **Flight #:** 28 **Photo #:** 216

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
Unit 2 is mapped as a Forested Upland and Forested Wetland complex on gently sloping ground. A minimum of partial suspension is required (BMP 12.5 and 13). Full suspension is planned for with individual tree selection.

Landslide Prone Soils
The soils in Unit 2 have a low landslide potential. Erosion potential is also fairly low (see hydrology section).

Fisheries/Hydrology
Unit 2 has three polygons: 2a, 2b, and 2c. Polygon 2a is west of an alluvial/colluvial fan, 2b is located on a portion of the inactive AF2 fan, and 2c is east of the fan. The northern tips of 2a and 2c are next to a shallowly incised bedrock and colluvial-controlled Class III HC5 channel. An individual tree mark harvest that will leave approximately 50 percent of the trees is planned for 2a and 2c. This harvest method used outside the no-cut buffers will provide a reasonable assurance of windfirmness for the AF2 and HC5 channels.
Class III AF2 adjacent to 2a, 2b and 2c boundaries: a buffer that is the greater of 140 foot or active portion of alluvial fan is required. For polygon 2b, 10 percent of the trees that are greater than 140 feet from active channels may be removed.
Class III HC5 adjacent to 2a and 2c: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Follow BMPs 12.6, 12.6a and 13.9.

Silvicultural Prescription (Individual Tree & Group Selection)
Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Logging System and Unit Design
Helicopter harvest to a barge in Emerald Bay.

Alternative C Emerald Bay Study Area Draft EIS Unit 3

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 3
Alternative: C

Harvest Acres: 80 **MBF Volume:** 988 **CCF Volume:** 1976
Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 32

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
Almost all of unit 3 lies on a Forested Wetland and Forested Upland complex. The wetlands occur on moderately sloping to steep mineral soils. A minimum of partial suspension is required. The unit is planned for individual tree mark leaving 50 percent of the trees and helicopter yarding, which will meet resource objectives (BMP 12.5 and 13.9).

Landslide Prone Soils
Soils in Unit 3 are steep with an estimated 15 acres on slopes over 72 percent gradient. To meet soil resource concerns, 4 of the acres are in a leave island and the remaining slopes over 72 percent are in a partial cut helicopter yard setting (BMPs 13.5, 13.9, and 13.2). A minimum of partial suspension is required in the reminder of the unit (BMP 13.9).

Fisheries
Unit 3 borders Emerald Creek to the south and a water-quality stream to the east. The Class III water quality stream has formed a small alluvial deposit on the eastern boundary of Unit 3; the no-cut buffer should include the alluvium deposit.
Class III HC5 adjacent to east unit boundary: no timber harvest within the V-notch or on the alluvium deposit, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak/alluvium for windfirmness.
Class II HC1 adjacent to southeast unit corner: no harvest within the greater of 100 feet or the V-notch; manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness
Class II PA5 adjacent to south boundary: greater of 100 foot or RMA buffer required; additional 85 foot select harvest windfirm buffer required.
Follow BMPs 12.6, 12.6a and 13.16.

Silvicultural Prescription (Individual tree and Group Selection)
Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Harvest 4 acres using Group Selection removing all merchantable trees from areas ranging from 1/4 to 2 acres in size. Leave at least 200 feet between groups.

Logging System and Unit Design
Helicopter harvest to a barge in Emerald Bay.

Alternative C Emerald Bay Study Area Draft EIS Unit 5

- Class 1 Stream
- Class 2 Stream
- Class 3 Stream
- Class 4 Stream
- Unit Boundary
- Temporary Roads
- Spec Roads
- Salt Water
- Fresh Water Lakes
- Riparian Areas
- Encumbered Land
- Private Land
- Old Growth Reserves
- MM–Haz 4 Soils
- Slopes > 72%
- Windfirm Area
- High Value Marten

N W E S

0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 5
Alternative: C

Harvest Acres: 56 **MBF Volume:** 645 **CCF Volume:** 1290

Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 32

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
All of Unit 5 is mapped as a complex of Forested Wetlands and Forested Uplands. The Forested Wetlands are on mineral soils on moderately to steeply sloping ground. Partial suspension is required. Unit 5 is planned for helicopter yarding with full suspension, which will meet resource objectives outlined in BMP 12.5 and 13.9.

Landslide Prone Soils
There is approximately 1 acre of slopes greater than 72 percent gradient in Unit 5. The pitch is very short and landslide potential appears to be low (BMP 13.5). A minimum of partial suspension is required, and full suspension is planned via helicopter yarding (BMP 13.9).

Fisheries/Hydrology
Class III HC5 adjacent to tip of east unit boundary: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.

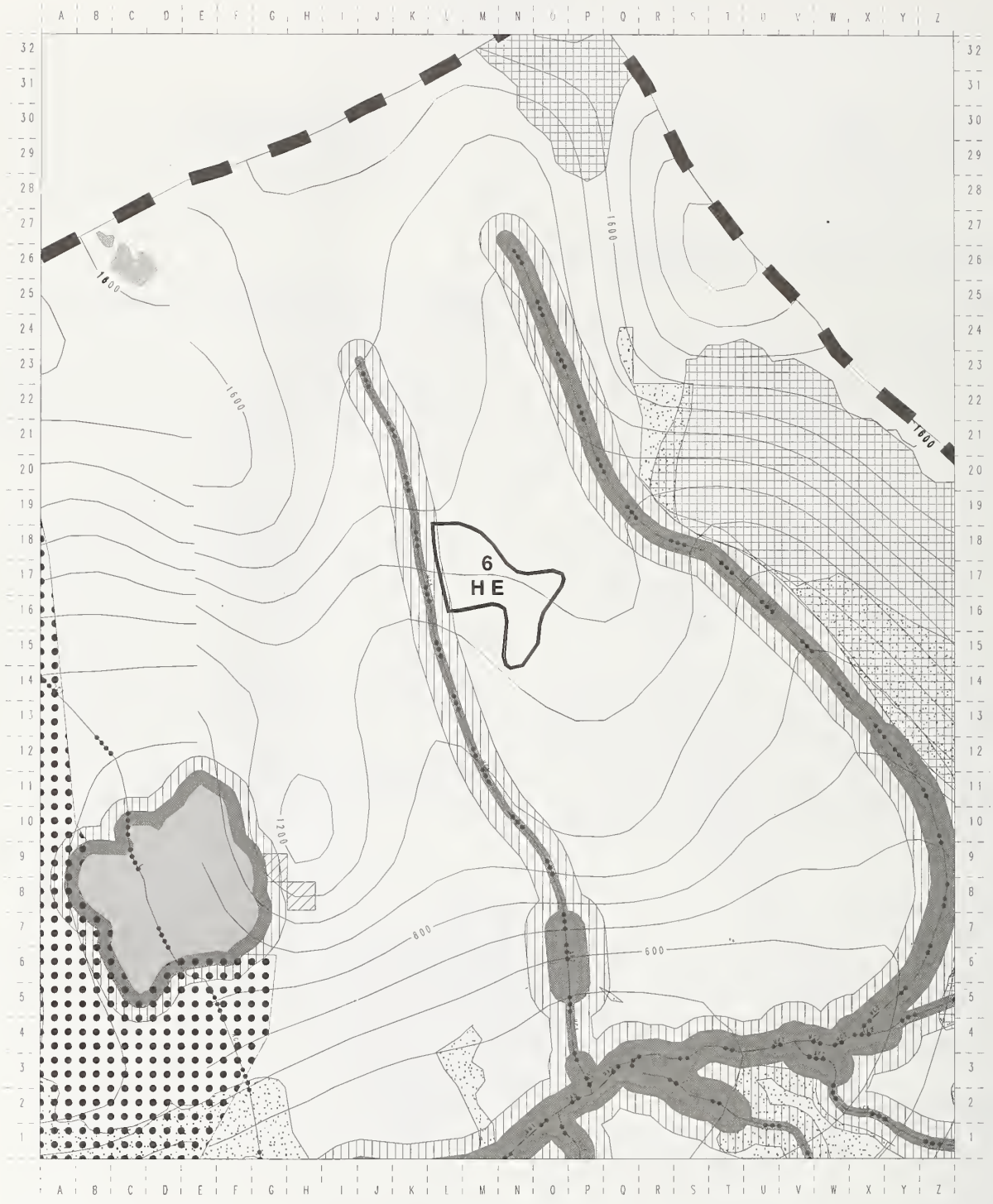
Silvicultural Prescription (Individual Tree & Group Selection)
Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Harvest 4 acres using Group Selection removing all merchantable trees from areas ranging from 1/4 to 2 acres in size. Leave at least 200 feet between groups.

Logging System and Unit Design
Helicopter harvest to a barge in Emerald Bay.

Alternative C Emerald Bay Study Area Draft EIS Unit 6



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 6
Alternative: C

Harvest Acres: 31 **MBF Volume:** 118 **CCF Volume:** 236
Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 32

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
The entire unit is mapped as Forested Wetland, cedar-hemlock-blueberry plant association. A minimum of partial suspension is required. Full suspension via helicopter yarding will provide a low-impact yarding method per BMP 12.5 and 13. Individual tree mark harvest of 50 percent of the trees will provide additional wetland protection.

Landslide Prone Soils
There are perhaps 2 acres of slopes greater than 72 percent in the unit associated with a small cliff. The soils in the unit have a low to moderate mass movement index. A minimum of partial suspension is required. Full suspension via helicopter yarding will be achieved (BMP 13.9).

Fisheries
Class III HC5 adjacent to west unit boundary: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.

Silvicultural Prescription (Individual tree Selection)
Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Logging System and Unit Design
Helicopter harvest to a barge in Emerald Bay.

Alternative C Emerald Bay Study Area Draft EIS Unit 9

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 9
Alternative: C

Harvest Acres: 48 **MBF Volume:** 432 **CCF Volume:** 864

Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 32

Resource Concerns and Mitigation

Wildlife

Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery

This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands

Nearly the entire unit is mapped as a Forested Wetland and Forested Wetland and Upland complex. A 1 acre non-forested poor fen (muskeg) lies in the southwest corner of the unit adjacent to the stream buffer on the west side of the unit. The muskeg could be included in the stream buffer (BMP 12.5 & 13.16). Partial suspension is required on the remainder of the unit (BMP 13.9). Full suspension will be achieved via helicopter yarding and an individual tree mark will provide additional resource protection.

Landslide Prone Soils

Slopes in Unit 9 range up to 60 percent gradient and no slopes over 72 percent were identified (BMP 13.5). Partial suspension is required to protect wetlands and prevent erosion (BMPs 13.9, 12.5 & 13.14). Full suspension and individual tree mark leaving 50 percent of the trees will further protect soil resources.

Fisheries

Unit 9 is bordered by a water-quality stream to the west and a Class II stream with high-value fish habitat, wetland, and riparian area to the south (BMPs 12.5 & 12.6l). The area south of the unit is fluvial and supports the only tall sedge fen identified on the Project Area. This area will require a windfirm buffer that includes the entire riparian area (BMPs 12.6a & 13.16). The extent of the riparian area needs to be verified during project implementation.
Class III HC5 adjacent to west unit boundary: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class III AF2 adjacent to west boundary: a buffer that is the greater of 140 foot or active portion of alluvial fan is required.
Class II HC1 adjacent to southwest unit corner: no harvest within the greater of 100 feet or the V-notch; manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness
Class II PA5 adjacent to south boundary: greater of 100 foot or RMA buffer required; additional 85 foot select harvest windfirm buffer required
Class II MC2 adjacent to south boundary: no harvest within the greater of 100 feet or the channel sideslope break required.

Silvicultural Prescription (Individual Tree Selection)

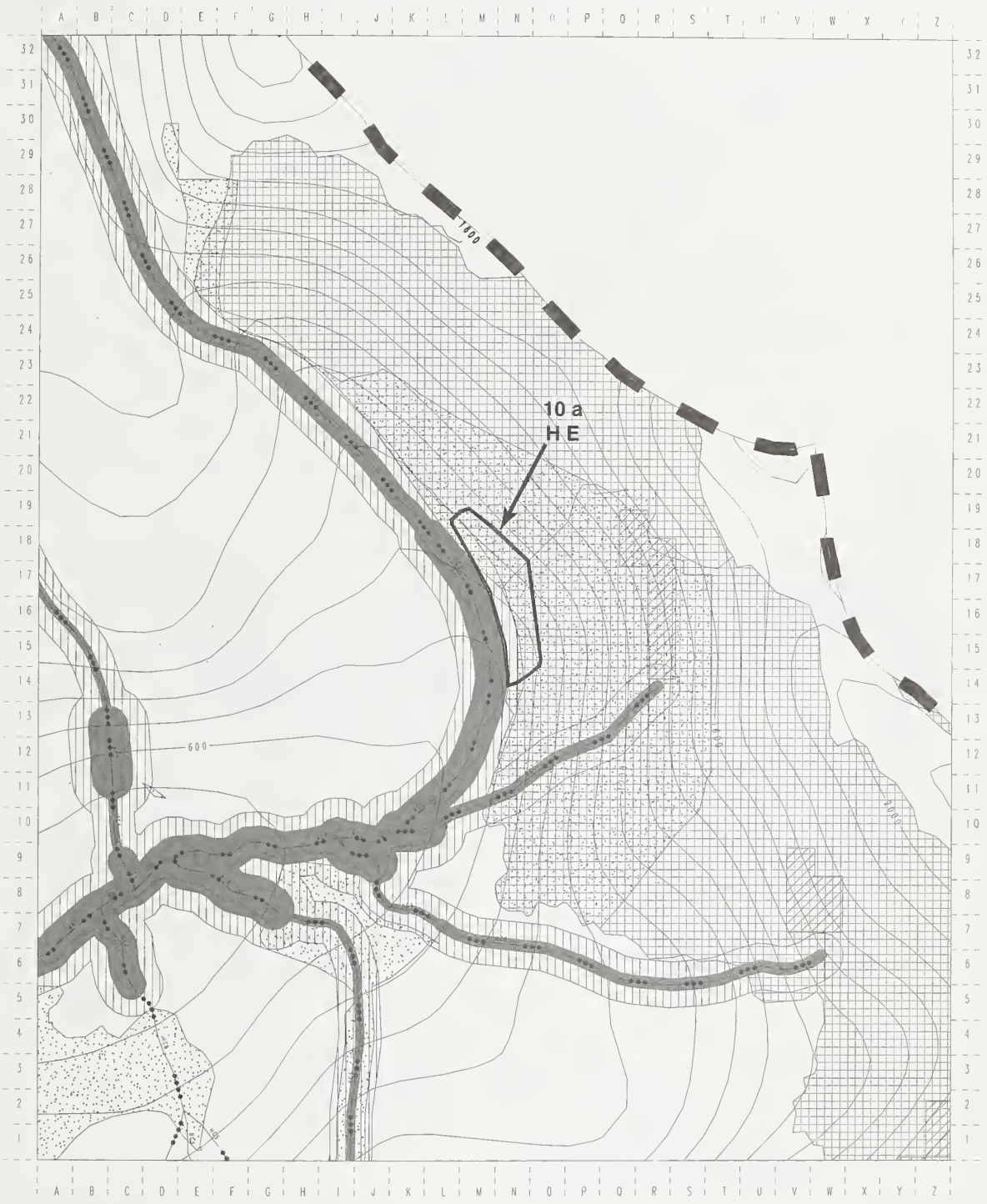
Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave:
A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Logging System and Unit Design

Helicopter harvest to a barge in Emerald Bay.

Alternative C Emerald Bay Study Area Draft EIS Unit 10a



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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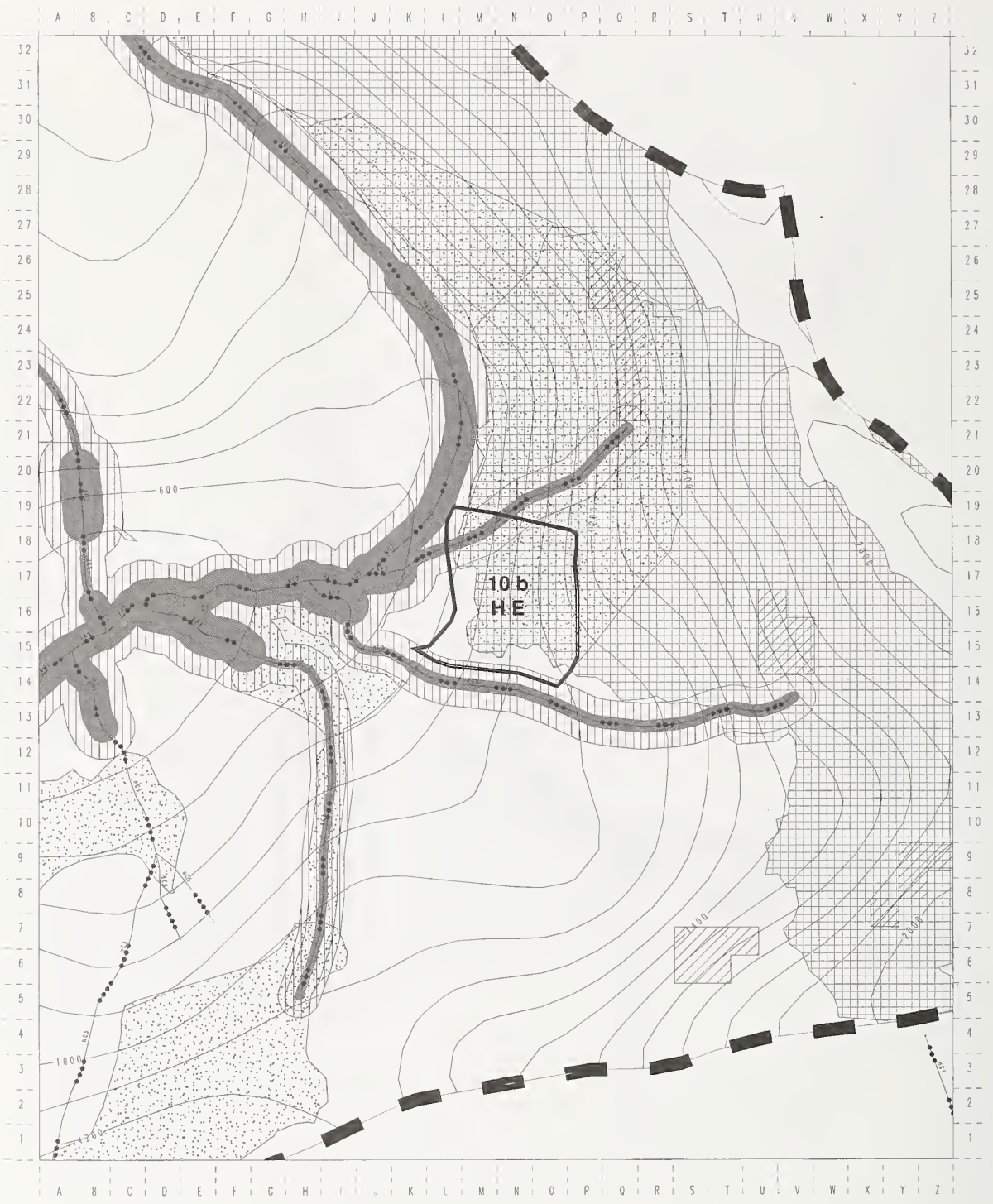
0 .05 0.1 Miles

Mapscale 1:12000

Alternative C Emerald Bay Study Area Draft EIS Unit 10b



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 10
Alternative: C

Harvest Acres: 31 **MBF Volume:** 432 **CCF Volume:** 864
Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 32

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Wetlands
The south end of Unit 10b is mapped as Forested Wetland. The remainder of the unit is mapped as Forested Upland and Forested Wetland complex. Field verification indicates that the unit is mostly uplands. Partial suspension is required to protect wetlands (BMP 12.5). Full suspension is planned via helicopter yarding (BMP 13.9).

Landslide Prone Soils
Slopes in Unit 10a and 10b are less than 60 percent gradient. No slopes over 72 percent were identified. The mass movement rating ranges from low to high in Unit 10b and low in Unit 10a. A minimum of partial suspension is required to prevent erosion (BMP 13.9 and 13.14). Full suspension is planned via helicopter yarding. Unit 10 is also planned for a selective harvest which will further minimize erosion.

Fisheries
The western boundary of Unit 10a is next to the mainstem. Unit 10b lies between the mainstem and a Class III tributary. A smaller Class III stream flows through the northwest corner of Unit 10b.
Class II HC3 adjacent to west Unit 10a boundary: no harvest within the greater of 100 feet or the V-notch; manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class II MC2 adjacent to west Unit 10a boundary: no harvest within the greater of 100 feet or the channel sideslope break required; manage a reasonable distance (site potential tree height is 100 feet) beyond the slopebreak for windfirmness.
Class II MC2 adjacent to northwest Unit 10b boundary: no harvest within the greater of 100 feet or the channel sideslope break required; manage a reasonable distance (site potential tree height is 100 feet) beyond the slopebreak for windfirmness.
Class III HC6 adjacent to south Unit 10b boundary: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class III HC6 transects northwest corner of Unit 10b: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Follow BMPs 12.6, 12.6a and 13.16.

Silvicultural Prescription (Individual Tree & Group Selection)
Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Harvest 4 acres using Group Selection removing all merchantable trees from areas ranging from 1/4 to 2 acres in size. Leave at least 200 feet between groups.

Logging System and Unit Design
Helicopter harvest to a barge in Emerald Bay.

Alternative C Emerald Bay Study Area Draft EIS Unit 11

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 11
Alternative: C

Harvest Acres: 135 **MBF Volume:** 1720 **CCF Volume:** 3440
Aerial Photo: 1973 **Flight #:** 29 **Photo #:** 31

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
There are approximately 30 acres of Forested Wetlands on mineral soils in the east end of Unit 11. Partial suspension is required in this area (BMP 12.5 and 13.9)

Landslide Prone Soils
Slopes are dominantly less than 60 percent gradient in Unit 11 and no slopes over 72 percent were identified. The mass movement index ranges from low to high in the unit and partial suspension is required (BMP 13.9). Full suspension is planned and will provide additional resource protection. An individual tree mark, leaving about 50 percent of the trees will also provide additional resource protection. Soils mapped in the west end of the unit are relatively deep and somewhat erodible. Areas disturbed during logging should be revegetated as soon as possible to prevent erosion (BMP 12.17).

Fisheries
A partial cut silvicultural prescription for Unit 11 will leave about 50 percent of the trees in the unit, providing a reasonable assurance of windfirmness to the no-cut buffers along Class III streams.
Class III HC6 adjacent to east unit boundary: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class III HC5 flows north through unit: no timber harvest within the V-notch, manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class IV HC5 adjacent to southwest unit boundary. Directional felling required.
Class IV HC5 crosses tip of north unit boundary. Directional felling may be required.
Follow BMPs 12.6, 12.6a and 13.16.

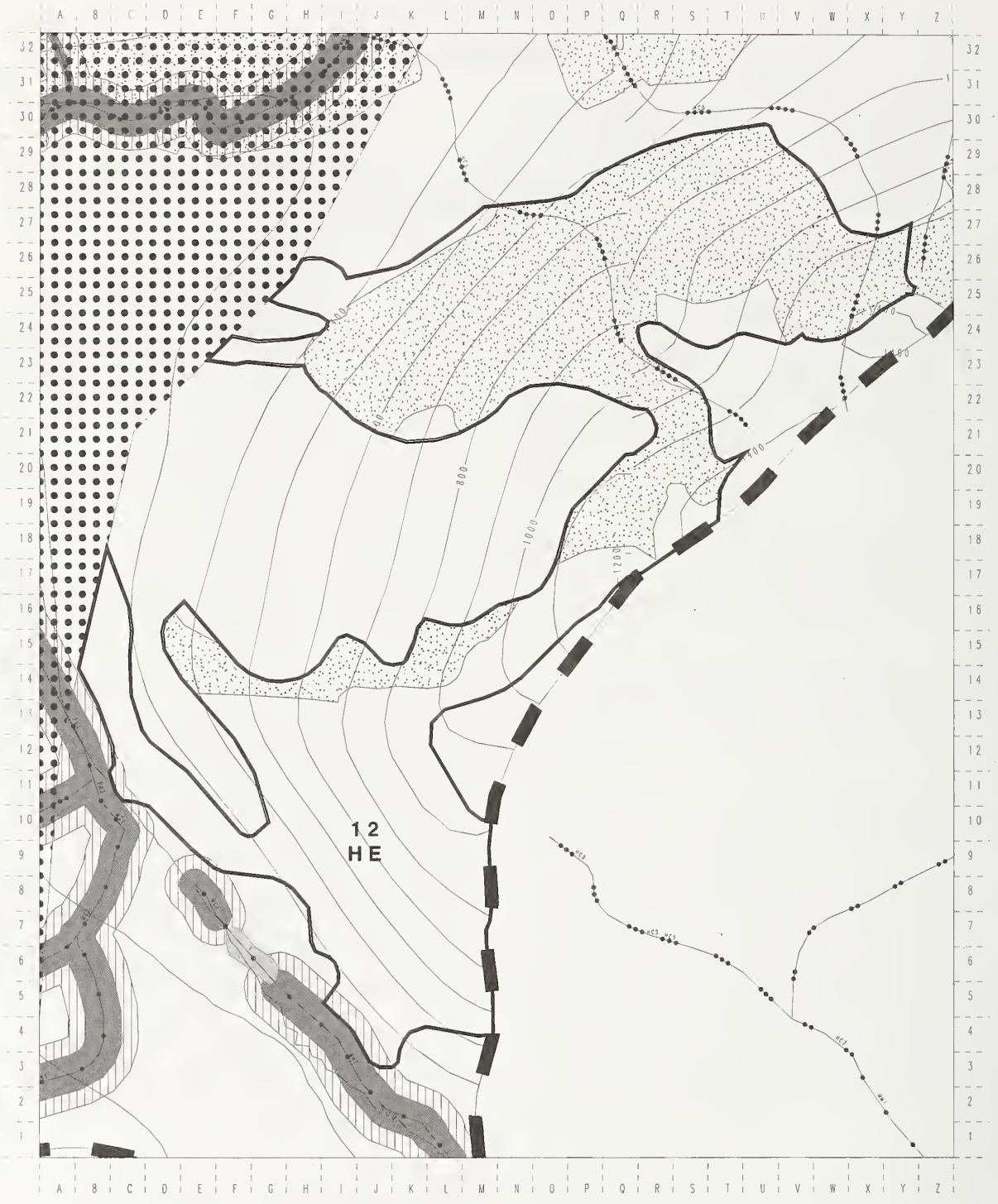
Silvicultural Prescription (Individual Tree & Group Selection)
Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Harvest 4 acres using Group Selection removing all merchantable trees from areas ranging from 1/4 to 2 acres in size. Leave at least 200 feet between groups.

Logging System and Unit Design
Helicopter harvest to a barge in Emerald Bay.

Alternative C Emerald Bay Study Area Draft EIS Unit 12



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

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0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 12
Alternative: C

Harvest Acres: 273 **MBF Volume:** 3655 **CCF Volume:** 7310

Aerial Photo: 1973 **Flight #:** 28 **Photo #:** 217

Resource Concerns and Mitigation

Wildlife

Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery

This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands

The unit boundary has been modified to avoid timber harvest on forested organic soils per the TLMP ROD. The southern quarter of Unit 12 lies on Forested Wetlands. Partial suspension is required (BMP12.5 & 13.9). Full suspension with partial harvest will provide additional protection to the wetlands resource. Most of the unit is underlain by well-drained upland soils.

Landslide Prone Soils

Slopes in Unit 12 range from 20 up to 70 percent gradient. No slopes over 72 percent were identified. The landslide potential ranges from low to high. Partial suspension is required to mitigate landslide and erosion potential (BMP 13.9). Full suspension with a partial harvest prescription will provide additional resource protection. Soils under much of the unit area are deep and somewhat erodible. Revegetation of any areas disturbed during yarding should be completed as soon as possible (BMP 12.17).

Fisheries

A Class I stream with a pond and short sedge wetland drains the west end of the unit. The short sedge wetland is part of the riparian area around the pond.
Class 1 MC1 adjacent to west boundary: no harvest within the greater of 100 feet or the channel sideslope break required, manage a reasonable distance (site potential tree height is 100 feet) beyond the slopebreak for windfirmness.
Class I PA5 adjacent to west boundary: greater of 100 foot or RMA buffer required; manage a reasonable distance (site potential tree height is 85 feet) beyond the slopebreak for windfirmness.
Class I MM1 adjacent to west boundary: greater of 120 feet or RMA buffer required; manage a reasonable distance (site potential tree height is 120 feet) beyond the slopebreak for windfirmness.
Class IV HC5 (two) flow through northern part of unit. Directional felling, split yarding, and full suspension may be required.
Follow BMPs 12.6, and 13.16.

Silvicultural Prescription (Individual Tree & Group Selection)

Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in Record of Decision unit cards.

Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Harvest 10 acres using Group Selection removing all merchantable trees from areas ranging from 1/4 to 2 acres in size. Leave at least 200 feet between groups.

Logging System and Unit Design

Helicopter harvest to a barge in Emerald Bay.

Alternative C Emerald Bay Study Area Draft EIS Unit 13

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Temporary Roads
Spec Roads

Salt Water
Fresh Water Lakes
Riparian Areas
Encumbered Land
Private Land

Old Growth Reserves
MM–Haz 4 Soils
Slopes > 72%
Windfirm Area
High Value Marten

N
W
E
S

0 .05 0.1 Miles

Mapscale 1:12000

Emerald Bay Unit Card
Unit 13
Alternative: C

Harvest Acres: 7 **MBF Volume:** 72 **CCF Volume:** 144
Aerial Photo: 1973 **Flight #:** 28 **Photo #:** 218

Resource Concerns and Mitigation

Wildlife
Marten guidelines apply: maintain 10-20 percent of canopy, average 4 large trees/acre (20-30"+), average 3 snags per acre, average 3 pieces downed logs/acre (20-30"+).
Additional project-level wildlife surveys are scheduled for 1999.

Scenery
This unit as designed meets the Forest Plan visual objective of maximum modification as viewed in the middleground from the Ernest Sound visual priority route.

Wetlands
About 3 acres of forested wetlands occur in Unit 13. A minimum of partial suspension is required. Full suspension via helicopter yarding and a partial harvest prescription will provide additional protection to the wetland resources (BMP 12.5 and 13.9).

Landslide Prone Soils
Slopes in Unit 13 are less than 30 percent gradient. Landslide potential is low.

Fisheries/Hydrology
The partial harvest prescription will provide a reasonable assurance of windfirmness to the no-cut buffers on the stream on the east side of the unit.
Class II MM1 next to northeast unit boundary: greater of 120 foot or RMA buffer required, additional 120 foot select harvest windfirm buffer required.
Class II MC2 next to east unit boundary: no harvest within the greater of 100 feet or the channel sideslope break required; manage a reasonable distance (site potential tree height is 100 feet) beyond the slopebreak for windfirmness.
Follow BMPs 12.6, 12.6a and 13.16.

Silvicultural Prescription (Individual Tree & Group Selection)
Use Individual Tree Selection to remove approximately 50 percent of the merchantable volume using a prescription similar to that listed below. Final prescriptions will be prepared following further field inventory and summarized in unit cards.

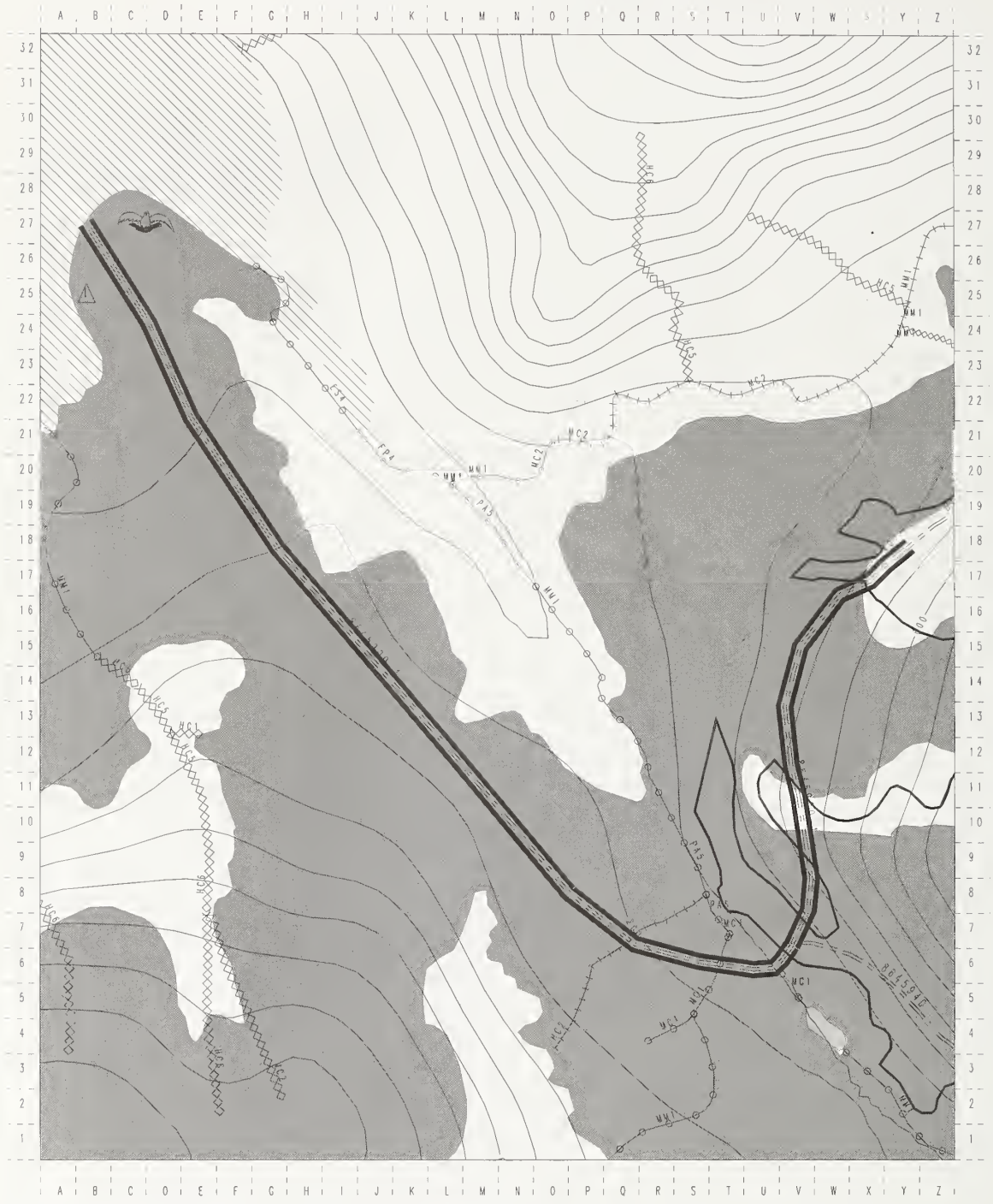
Leave: A. All Western Redcedar, Sitka Spruce and Alaska Yellowcedar 0-22 inches dbh.
B. All Hemlock 0-14 inches dbh and over 40 inches dbh.

Logging System and Unit Design
Helicopter harvest to a barge in Emerald Bay.

Appendix C

Road Cards

Emerald Bay Study Area Road Card 8645900–1



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Eagle Nest
Rock Pit

Proposed Road
Selected Road
Existing Road
Reconstruct Road
Salt Water
Fresh Water Lakes
High Value Wetlands
Other Wetlands

Road Number	Miles
8645900–1	2.74
	2.74

N
W
E
S

0 0.1 0.2 Miles

Mapscale 1:15840

Road Management Objectives

Project/EIS	System Land	Use Designation
Emerald Bay	Cleveland Peninsula	TM

Route No.	Route Name	Status
8645900-1	Emerald	New construction

Begin M.P.	Length	Begin Termini	End Termini
0.00	2.74	0.00	2.74

General Design Criteria and Elements

Functional Class	Service Life	Traffic Service Level	Surface	Width	Critical Vehicle	Design Vehicle	Design Speed
L	LI	D	Rock	14	Log Truck	Log Truck	10

Intended Purpose/Future Use:
Silvicultural activities

Maintenance Criteria

Operational Maintenance Level: 2 **Objective Maintenance Level:** 1

Maintenance Narrative:

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership **AFRPR Status:** Closed

Travel Management Strategies

Encourage:	N/A
Accept:	Hikers, Bicycles, ORVs
Discourage:	N/A
Prohibit:	N/A
Eliminate:	N/A

Travel Management Narrative: Remove all drainage structures upon completion of silvicultural activities. Water bar and grass seed entire roadway.

District Ranger Approval (signature)_____**Date:**_____

Road Management Objectives

Site Specific Design Criteria

Road No. 8645900-1

Road Location: Road accesses all units. Road construction should be moderate to easy over most portions of the road. Road located to accommodate logging systems and still have least impact on the other resources. There are no sections where road location crosses steep slopes over 67%. LTF located on this road.

Wetlands: This section of the 8645900 road is almost entirely located on wetlands (1.69 miles). Wetlands are unavoidable while avoiding the floodplain and adjacent sloping ground (BMP 12.5 and 14.2 and CFR BMP 1). The wetlands crossed are a complex of forested wetlands, scrub-shrub evergreen wetlands, and poor fens. A rock pit will likely need to be developed on a wetland site as upland sites are not available (BMP 14.2 and CFR BMP 4 and 5). Few cross drains will be necessary on the first mile of road as it is located on a topographic rise (BMP 14.2). The road is planned for closure following harvest via removal of all drainage structures (BMP 14.22 and CFR BMPs 2 and 7). Closure should be adequate to discourage ATVs from crossing streams and wetlands. This road meets the requirements for the silvicultural exemption from the 404 permitting process.

Road location was completed to avoid wetlands, although wetlands were unavoidable on nearly the entire length of the proposed road due to safety considerations, engineering design constraints and considerations for other resources.

Erosion Control: An erosion control plan for construction and maintenance will be developed by the contractor and approved by the Contracting Officer (BMP 14.5). All areas of organic or mineral soil exposed during construction shall be grass seeded and fertilized (BMP 12.17, 14.8).

Rock Pits: As shown on the map, no major concerns. Timing will be required on all pit and road right-of-way blasting within 1/2 mile of known eagle nests.

Resource Information (if applicable):

Timber/Logging Systems:

Soils/Water: Road 8645900-1 crosses wetlands on gentle slopes for almost its entire length (BMP 14.7). Apply BMPs 12.5 and 14.2 and CFR BMPs 1, 2, 5, 6, 7, and 14. Keep clearing widths narrow outside of harvest units (CFR BMP 6). Use BMP 14.12 to control excavation of sidecast material and overburden from the rock pit.

Silviculture:

Lands/Minerals/Geology/Karst:

Wildlife:

Visual/Recreation:

Cultural: **If any cultural resource sites are encountered, stop activities in the vicinity of the find and notify the archaeologist.**

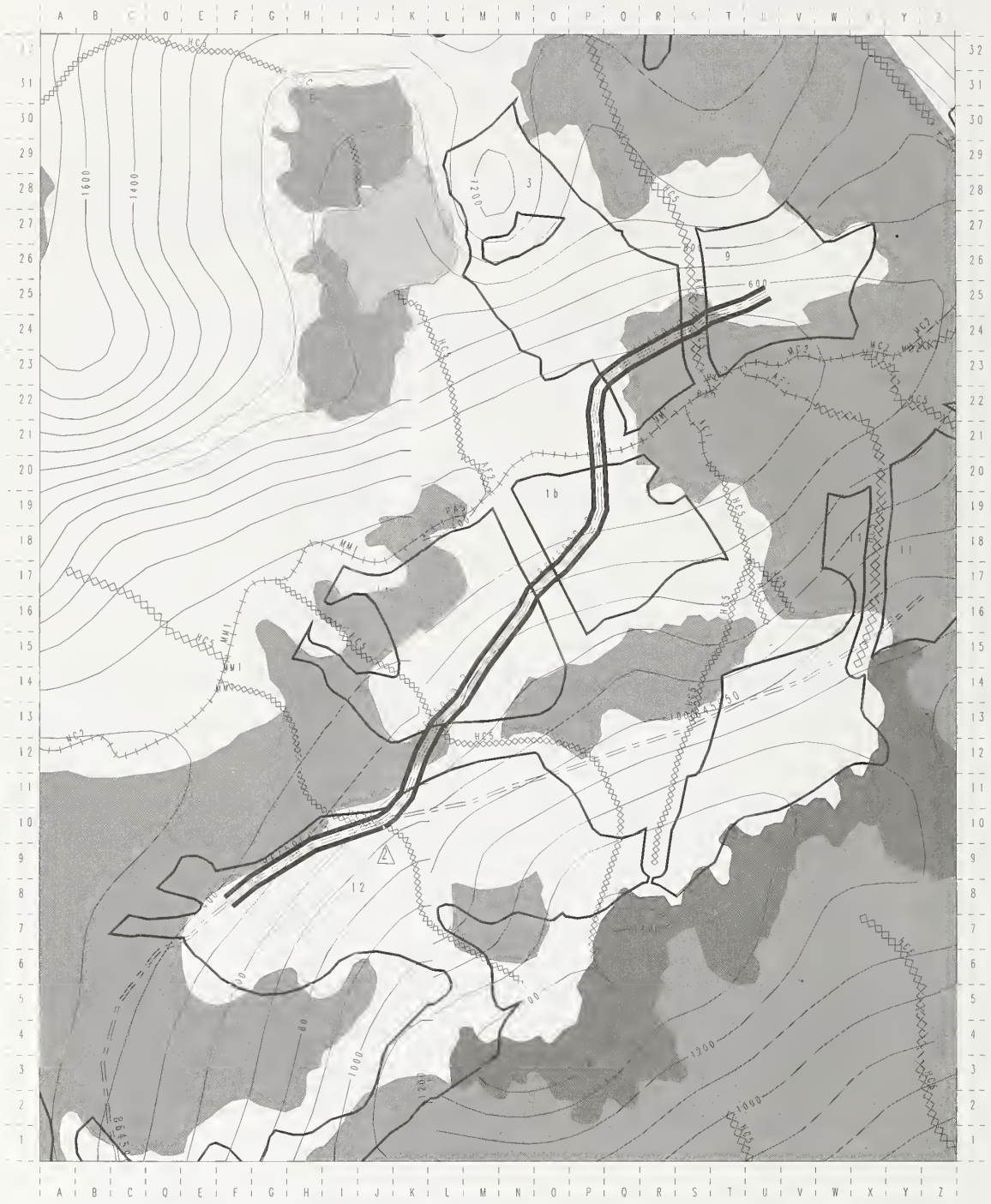
Road Management Objectives

Stream Crossings

Road No. 8645900-1

A) M.P. 1.47	AHMU Class II	Channel Type: HC2	BF Width: 0.8m
	BF Depth: 8cm	Substrate: bdrk	Gradient: 12%
	Structure: 900mm cmp	Passage Req'd.: yes	Timing Dates: none
Narrative:			
B) M.P. 0.62	AHMU Class I	Channel Type: MC1	BF Width: 0.5m
	BF Depth: 5cm	Substrate: cbbles	Gradient: 10 %
	Structure: 900mm cmp	Passage Req'd.: yes	Timing Dates: June 15 to August 7
Narrative:			
C) M.P. 0.70	AHMU Class II	Channel Type: MC1	BF Width: 0.5m
	BF Depth: 5cm	Substrate: bdrk	Gradient: 12 %
	Structure: 900mm cmp	Passage Req'd.: yes	Timing Dates: none
Narrative:			
D) M.P. 1.25	AHMU Class IV	Channel Type: HC6	BF Width: 0.5m
	BF Depth: 60mm	Substrate: bdrk	Gradient: 15 %
	Structure: 450mm cmp	Passage Req'd.: no	Timing Dates: none
Narrative:			

Emerald Bay Study Area Road Card 8645900–2



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Eagle Nest
Rock Pit

Proposed Road
Selected Road
Existing Road
Reconstruct Road
Salt Water
Fresh Water Lakes
High Value Wetlands
Other Wetlands

Road Number	Miles
8645900–2	1.56
	1.56

N
W
E
S

0 0.1 0.2 Miles

Mapscale 1:15840

Road Management Objectives

Project/EIS	System Land	Use Designation
Emerald Bay	Cleveland Peninsula	TM

Route No.	Route Name	Status
8645900-2	Ruby	New construction

Begin M.P.	Length	Begin Termini	End Termini
0.00	1.56	2.74	4.30

General Design Criteria and Elements

Functional Class	Service Life	Traffic Service Level	Surface	Width	Critical Vehicle	Design Vehicle	Design Speed
L	LI	D	Rock	14	Log Truck	Log Truck	10

Intended Purpose/Future Use:
Silvicultural activities

Maintenance Criteria

Operational Maintenance Level: 2 **Objective Maintenance Level:** 1

Maintenance Narrative:

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership **AFRPR Status:** Closed

Travel Management Strategies

Encourage:	N/A
Accept:	Hikers, Bicycles, ORVs
Discourage:	N/A
Prohibit:	N/A
Eliminate:	N/A

Travel Management Narrative: Remove all drainage structures upon completion of silvicultural activities. Water bar and grass seed entire roadway.

District Ranger Approval (signature)_____**Date:**_____

Road Management Objectives

Site Specific Design Criteria

Road No. 8645900-2

Road Location: Road accesses units 12, 9, 10, 3. Road construction should be moderate to easy over most portions of the road. Road located to accommodate logging systems and still have least impact on the other resources. There are no sections where road location crosses steep slopes over 67%.

Wetlands: Road 8645900-2 crosses approximately 0.26 miles of forested wetland and 0.64 miles of forested wetland and nonforested non-wetland complex. The wetlands are unavoidable while accessing harvest units (BMP 12.5 and CFR BMPs 1 and 2). Limit excavation of sidecast material to the road corridor (BMP 14.12). The road includes a crossing on Emerald Creek, a Class 2 fish stream. Passage is planned for (CFR BMP 7). Rock pits need to be located outside wetland areas (BMP 12.5 and CFR BMP 8). Minimize clearing widths in wetlands outside harvest units (CFR BMP 5 and 6). Road 8645900-2 is planned for closure following harvest via removal of all drainage structures (BMP 14.22). This road meets the silvicultural exemption from the 404 permitting process.

Road location was completed to avoid wetlands, although wetlands were unavoidable (m.p. 0.40 to 0.43 and 1.40 to 1.49) due to safety considerations, engineering design constraints and considerations for other resources.

Erosion Control: An erosion control plan for construction and maintenance will be developed by the contractor and approved by the Contracting Officer (BMP 14.5). All areas of organic or mineral soil exposed during construction shall be grass seeded and fertilized (BMP 12.17, 14.8).

Rock Pits: As shown on the map, no major concerns. Timing will be required on all pit and road right-of-way blasting within 1/2 mile of known eagle nests.
Resource Information (If applicable):

Timber/Logging Systems:

Soils/Water: Road 8645900-2 traverses relatively stable slopes (BMP 14.2 and 14.7). The crossing on Emerald Creek is in a stable location. Use BMP 14.14 to minimize in-channel operations. The road should be located upslope of the colluvial/alluvial fan formed by the stream between units 3 and 9. (BMP 14.2). Remove drainage structures on this stream following harvest (BMP 14.17 and 14.22). Close road in such a way as to discourage ATV use in and adjacent to streams and wetlands (BMP 14.22).

Silviculture:

Lands/Minerals/Geology/Karst:

Wildlife:

Visual/Recreation:

Cultural: **If any cultural resource sites are encountered, stop activities in the vicinity of the find and notify the archaeologist.**

Road Management Objectives

Stream Crossings

Road No. 8645900-2

A) M.P. 0.25	AHMU Class IV	Channel Type: HC5	BF Width: 0.4m
	BF Depth: 3cm	Substrate: bdrk	Gradient: 22%
	Structure: 450mm cmp	Passage Req'd.: no	Timing Dates: none

Narrative:

B) M.P. 0.47	AHMU Class IV	Channel Type: HC5	BF Width: 0.4m
	BF Depth: 3cm	Substrate: bdrk	Gradient: 22%
	Structure: 450mm cmp	Passage Req'd.: no	Timing Dates: none

Narrative:

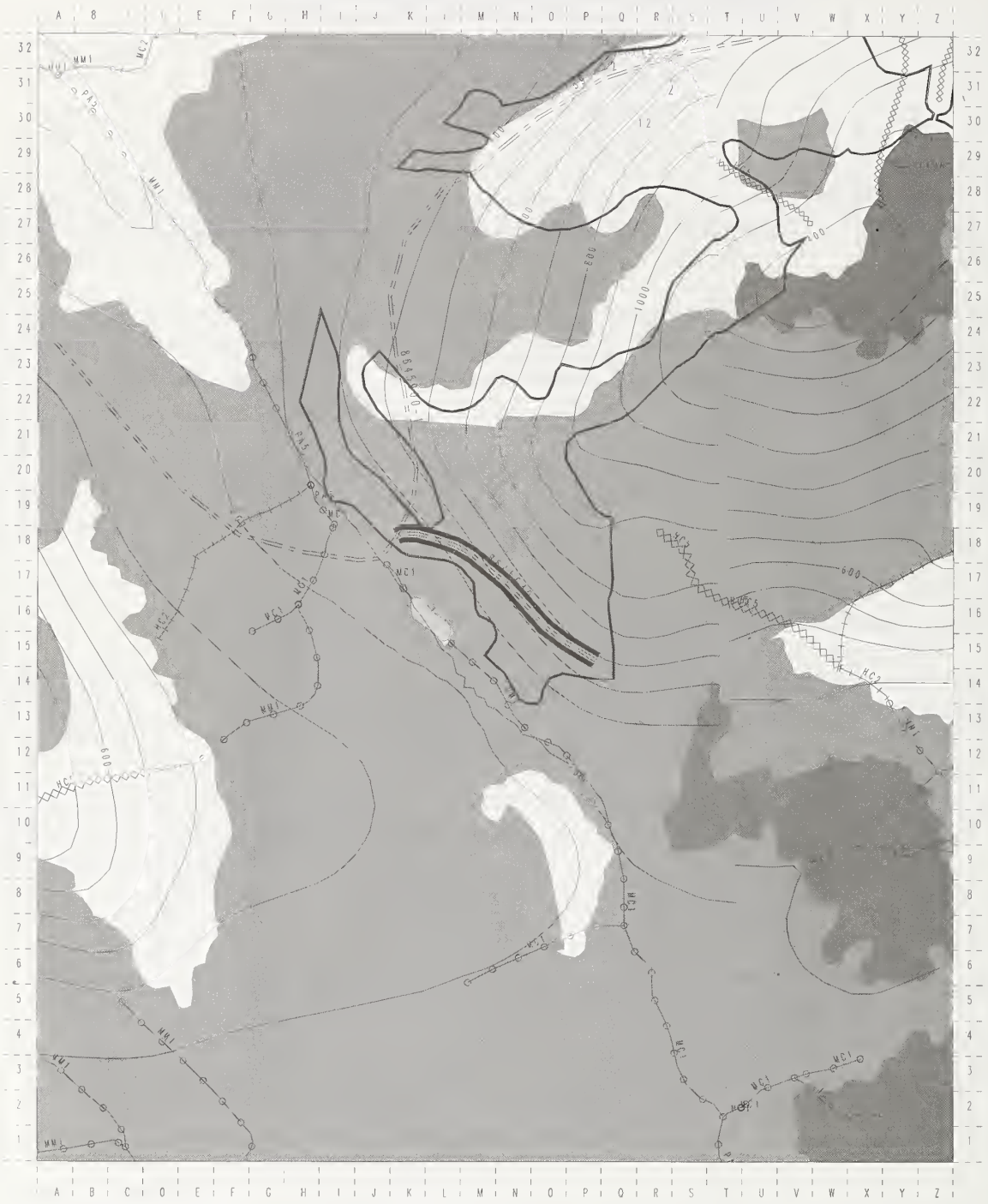
C) M.P. 1.05	AHMU Class II	Channel Type: MM1	BF Width: 8.0m
	BF Depth: 24cm	Substrate: cbbles	Gradient: 6%
	Structure: bridge	Passage Req'd.: yes	Timing Dates: none

Narrative:

D) M.P. 1.49	AHMU Class III	Channel Type: HC5	BF Width: 3.0m
	BF Depth: 3cm	Substrate: bdrk	Gradient: 18%
	Structure: 450mm cmp	Passage Req'd.: no	Timing Dates: none

Narrative:

Emerald Bay Study Area Road Card 8645940



Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Eagle Nest
Rock Pit

Proposed Road
Selected Road
Existing Road
Reconstruct Road
Salt Water
Fresh Water Lakes
High Value Wetlands
Other Wetlands

Road Number	Miles
8645940	0.43
	0.43

N
W
E
S

0 0.1 0.2 Miles

Mapscale 1:15840

Road Management Objectives

Project/EIS	System Land	Use Designation
Emerald Bay	Cleveland Peninsula	TM

Route No.	Route Name	Status
8645940	Ruby	New construction

Begin M.P.	Length	Begin Termini	End Termini
0.00	0.43	0.00	0.43

General Design Criteria and Elements

Functional Class	Service Life	Traffic Service Level	Surface	Width	Critical Vehicle	Design Vehicle	Design Speed
L	LI	D	Rock	14	Log Truck	Log Truck	10

Intended Purpose/Future Use:
Silvicultural activities

Maintenance Criteria

Operational Maintenance Level: 2 **Objective Maintenance Level:** 1

Maintenance Narrative:

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership **AFRPR Status:** Closed

Travel Management Strategies

Encourage:	N/A
Accept:	Hikers, Bicycles, ORVs
Discourage:	N/A
Prohibit:	N/A
Eliminate:	N/A

Travel Management Narrative: Remove all drainage structures upon completion of silvicultural activities. Water bar and grass seed entire roadway.

District Ranger Approval (signature)_____**Date:**_____

Road Management Objectives

Site Specific Design Criteria

Road No. 8645940

Road Location: Road accesses unit 12 (south end). Road construction should be moderate to easy over most portions of the road. Road located to accommodate logging systems and still have least impact on the other resources. There are no sections where road location crosses steep slopes over 67%.

Wetlands: Road 8645940 is located entirely on forested wetlands within unit 12. The wetlands are part of the harvest unit and unavoidable (BMP 12.5 and 14.2 and CFR BMP 1 and 2). Borrow material may need to come from a rock pit in wetlands, the same pit that serves the 8645900-1 (CFR BMP *). Clean fill will be used (CFR BMP 14). Road 8645940 is scheduled to be closed following harvest via removal of all drainage structures (BMP 14.22). This road meets the requirements for the silvicultural exemption from the 404 permitting process.

Road location was completed to avoid wetlands, although wetlands were unavoidable, as the entire proposed road is on designated wetlands, due to safety considerations, engineering design constraints and considerations for other resources.

Erosion Control: An erosion control plan for construction and maintenance will be developed by the contractor and approved by the Contracting Officer (BMP 14.5). All areas of organic or mineral soil exposed during construction shall be grass seeded and fertilized (BMP 12.17, 14.8).

Rock Pits: As shown on the map, no major concerns. Timing will be required on all pit and road right-of-way blasting within 1/2 mile of known eagle nests.

Resource Information (if applicable):

Timber/Logging Systems:

Soils/Water: The 8645940 road is located on stable slopes (BMP 14.2 and 14.7). Use BMP 14.12 to keep excavated material out of the riparian area surrounding the pond downslope of the road.

Silviculture:

Lands/Minerals/Geology/Karst:

Wildlife:

Visual/Recreation:

Cultural: **If any cultural resource sites are encountered, stop activities in the vicinity of the find and notify the archaeologist.**

Road Management Objectives

Stream Crossings

Road No. 8645940

A) M.P. 0.25	AHMU Class IV	Channel Type: HC5	BF Width: 0.4m
	BF Depth: 3cm	Substrate: bdrk	Gradient: 22%
	Structure: 450mm cmp	Passage Req'd.: no	Timing Dates: none

Narrative:

B) M.P. 0.47	AHMU Class IV	Channel Type: HC5	BF Width: 0.4m
	BF Depth: 3cm	Substrate: bdrk	Gradient: 22%
	Structure: 450mm cmp	Passage Req'd.: no	Timing Dates: none

Narrative:

C) M.P. 1.05	AHMU Class II	Channel Type: MM1	BF Width: 8.0m
	BF Depth: 24cm	Substrate: cbbles	Gradient: 6%
	Structure: bridge	Passage Req'd.: yes	Timing Dates: none

Narrative:

D) M.P. 1.49	AHMU Class III	Channel Type: HC5	BF Width: 3.0m
	BF Depth: 3cm	Substrate: bdrk	Gradient: 18%
	Structure: 450mm cmp	Passage Req'd.: no	Timing Dates: none

Narrative:

Emerald Bay Study Area Road Card 8645950

Class 1 Stream
Class 2 Stream
Class 3 Stream
Class 4 Stream
Unit Boundary
Eagle Nest
Rock Pit

Proposed Road
Selected Road
Existing Road
Reconstruct Road
Salt Water
Fresh Water Lakes
High Value Wetlands
Other Wetlands

Road Number	Miles
8645950	1.05
	1.05

N
W E
S

0 0.1 0.2 Miles

Mapscale 1:15840

Road Management Objectives

Project/EIS	System Land	Use Designation
Emerald Bay	Cleveland Peninsula	TM

Route No.	Route Name	Status
8645950	Sapphire	New construction

Begin M.P.	Length	Begin Termini	End Termini
0.00	0.05	0.00	1.05

General Design Criteria and Elements

Functional Class	Service Life	Traffic Service Level	Surface	Width	Critical Vehicle	Design Vehicle	Design Speed
L	LI	D	Rock	14	Log Truck	Log Truck	10

Intended Purpose/Future Use:
Silvicultural activities

Maintenance Criteria

Operational Maintenance Level: 2 **Objective Maintenance Level:** 1

Maintenance Narrative:

Operation Criteria

Highway Safety Act: No **Jurisdiction:** National Forest ownership **AFRPR Status:** Closed

Travel Management Strategies

Encourage:	N/A
Accept:	Hikers, Bicycles, ORVs
Discourage:	N/A
Prohibit:	N/A
Eliminate:	N/A

Travel Management Narrative: Remove all drainage structures upon completion of silvicultural activities. Water bar and grass seed entire roadway.

District Ranger Approval (signature)_____**Date:**_____

Road Management Objectives

Site Specific Design Criteria

Road No. 8645950

Road Location: Road accesses unit 11 & 12. Road construction should be moderate to easy over most portions of the road. Road located to accommodate logging systems and still have least impact on the other resources. There are no sections where road location crosses steep slopes over 67%.

Wetlands: Less than 0.1 miles of the 8645950 road are located on forested wetlands in the east end of unit 11. Wetlands were avoided in location (BMP 12.5, 14.2 and CFR BMPs 1 and 2). Road 8645950 is planned for closure following harvest via removal of all drainage structures (BMP 14.22 and CFR BMP 4). Road 8645950 meets the requirements for the silvicultural exemption from the 404 permitting process.

Road location was completed to avoid wetlands, although wetlands were unavoidable (m.p. 0.97 to m.p.1.05), due to safety considerations, engineering design constraints and considerations for other resources.

Erosion Control: An erosion control plan for construction and maintenance will be developed by the contractor and approved by the Contracting Officer (BMP 14.5). All areas of organic or mineral soil exposed during construction shall be grass seeded and fertilized (BMP 12.17, 14.8).

Rock Pits: As shown on the map, no major concerns. Timing will be required on all pit and road right-of-way blasting within 1/2 mile of known eagle nests.

Resource Information (if applicable):

Timber/Logging Systems:

Soils/Water: Road 8645950 crosses relatively deep colluvial soils on moderate sideslopes. Use BMPs 14.8, 14.11 and 14.9 to minimize erosion potential. Road closure will involve removal of all drainage structures, and streambanks may need reshaping (BMPs 14.22 and 14.14). Timely grass seeding is important to minimize erosion from this road (BMPs 14.5 and 14.11).

Silviculture:

Lands/Minerals/Geology/Karst:

Wildlife:

Visual/Recreation:

Cultural: **If any cultural resource sites are encountered, stop activities in the vicinity of the find and notify the archaeologist.**

Road Management Objectives

Stream Crossings

Road No. 8645950

A) M.P. 0.35	AHMU Class IV	Channel Type: HC5	BF Width: 0.4m
	BF Depth: 3cm	Substrate: bdrk	Gradient: 22%
	Structure: 450mm cmp	Passage Req'd.: no	Timing Dates: none

Narrative:

B) M.P. 0.50	AHMU Class IV	Channel Type: HC5	BF Width: 0.4m
	BF Depth: 3cm	Substrate: bdrk	Gradient: 22%
	Structure: 450mm cmp	Passage Req'd.: no	Timing Dates: none

Narrative:

C) M.P. 0.97	AHMU Class III	Channel Type: HC5	BF Width: 1.5m
	BF Depth: 4cm	Substrate: bdrk	Gradient: 16%
	Structure: 1,200mm cmp	Passage Req'd.: no	Timing Dates: none

Narrative:

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